School of Information Systems

A Mobile Learning Framework for Universities in Pakistan

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DECLARATION

This thesis contains no materials which have been accepted for the award of any other degree or diploma in any university.

To the best of my knowledge and belief, this thesis contains no materials previously published by any other person except where due acknowledgement has been made.

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ABSTRACT

Mobile learning is a method of learning that is independent of time and location. Mobile devices can add flexibility to learning environments; researchers around the world, particularly in developed countries, have been experimenting with mobile learning at different educational levels from elementary schools to higher education and workplace training. Mobile learning is also being researched and tested in several developing countries including South Africa, India, Indonesia, Kenya and Latin America. These projects have shown positive results in being able to provide education to the underprivileged populations living in remote and backward areas. However, only a few research projects have evaluated the feasibility of introducing mobile learning in university environments and the higher education sectors in developing countries. This research aims at identifying mobile learning characteristics and developing a mobile learning framework for university environments in Pakistan.

Exploratory case study was chosen as the research method, including qualitative research approaches such as focus groups of students and teachers from three Pakistani universities, and individual interviews with administrative stakeholders of those universities. Data was analyzed using NVivo 10 qualitative data analysis software which involved an iterative coding process to categorize main themes, subthemes and building relationships among themes. Findings of the research indicate that all of the participants including students, teachers, IT managers, educational designers and senior administrators in policy-making roles demonstrated a positive and optimistic attitude towards the introduction of mobile learning in Pakistani university environments. Findings derived from the data analysis show that pedagogical aspects of mobile learning were already being applied informally by a number of students and teachers in their teaching and learning practices in the form of many mobile learning activities. Therefore, participants were motivated to embrace mobile learning in a blended learning environment in Pakistani universities. However, the analysis of data gathered from focus groups and interviews also revealed that there were several socio-cultural factors that would impact on any proposed mobile learning implementations in Pakistani university environments in

the future. These socio-cultural factors include the need to raise awareness of mobile learning in Pakistani university environments before its formal inclusion in teaching and learning practices. Furthermore, the issue of cost and affordability for students from underprivileged social and financial backgrounds need to be addressed. In addition, the findings strongly revealed the need to meet the training requirements of teachers and students prior to engagement in formal mobile learning activities and potential negative exploitation of mobile learning opportunities by some stakeholders in teaching and learning environments in Pakistani universities.

Based on the outcomes of this research, a mobile learning framework for universities in Pakistan has been developed. This framework addresses the pedagogical as well as technological characteristics of mobile learning along with the participation of key stakeholders from the university environment. Socio-cultural factors potentially affecting the mobile learning implementation have also been presented in the framework. Higher education providers may be able to use this framework to implement mobile learning in Pakistani university environments in the future. There is also potential to use this framework in developing countries with attributes similar to the Pakistan higher education environments. Educational designers would be able to use this framework to include the pedagogical characteristics of mobile learning when designing mobile learning content. IT managers would be able to utilize this model to understand students' and teachers' perceptions of connectivity, and their need for training and ongoing technical support. Senior executives would be able to address key challenges associated with the costs of implementing and operationalizing mobile learning, This includes, the development of mobile learning content, infrastructural investments and of the acquisition of mobile devices for students and teachers.

As alluded earlier, the findings of this research may be generalized to other developing countries with similar higher education environment and socio-cultural environments. Developed countries could also benefit from the findings of this research in persuit of mobile learning implementation in university environments, particularly with cohorts of students from international backgrounds. Future research directions include a trial implementation of mobile learning in Pakistani university

environments and mobile learning research projects for underprivileged populations to provide them with basic education facilities using low cost mobile devices.

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PUBLISHED WORK

1. Imtinan, U., V. Chang, and T. Issa. 2014. "Envisioning Mobile Learning as the Future of Teaching and Learning Via Technology: A Literature Review of Mobile Learning". In Multicultural Awareness and Technology in Higher Education: Global Perspectives, eds Tomayess Issa, Pedro Isaias and Piet Kommers. IGI Global.

2. Imtinan, U., V. Chang, and T. Issa. 2013. "Offline Mobile Learning: A Proposal to Promote Literacy in Pakistani Rural Areas". *Electric Dreams, 30th Ascilite Conference, Sydney, Australia,* 2013. Macquarie University.

3. Imtinan, U., V. Chang, and T. Issa. 2013. Usability issues in mobile learning: Students' perceptions in Pakistani universities. QScience Proceedings: Vol. 2013, 12th World Conference on Mobile and Contextual Learning (mLearn 2013), 19.

4. Imtinan, U. 2013. "Mobile learning characteristics and challenges for developing countries – a case study of Pakistani universities". In Proceedings of *CBS Doctoral Students' Colloquium 2013,* October 1, 2013, Curtin Business School, Curtin University, Perth, Western Australia.

5. Imtinan, U., V. Chang, and T. Issa. 2013. "Common Mobile Learning Characteristics - An Analysis of Mobile Learning Models And Frameworks." In *Mobile Learning 2013, Mar 14, 2013*, Lisbon, Portugal: IADIS Press.

6. Imtinan, U., V. Chang, and T. Issa. 2012. "Characteristics of mobile learning environments in developing countries". The International Journal of Learning (18) (5): 163-173 (5).

7. Imtinan, U., V. Chang, and T. Issa. 2012. "Mobile Learning-Theoretical Underpinnings." Paper presented at *IADIS International Conference - Internet Technologies & Society 2012, Nov 28, 2012*, Perth, Australia.

8. Imtinan, U., V. Chang, and T. Issa. 2011 "Literature review of mobile learning in developing countries". The Eighteenth International Conference on Learning, Mauritius, July 5, 2011.

9. Imtinan, U., V. Chang, and T. Issa. "Developing a mobile learning conceptual model for universities in Pakistan". In *Proceedings of the IADIS International Conference: Internet Technologies and Society 2010*, edited by Piet Kommers, Tomayess Issa and Pedro Isaias, 316-320, Perth, Australia: IADIS press, 2010

10. Imtinan, U. 2010. "Identifying Mobile Learning Characteristics for Universities in Pakistan". In Proceedings of *CBS Doctoral Students' Colloquium 2010*, October 1, 2010, Curtin Business School, Curtin University, Perth, Western Australia.

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CHAPTER 1 **INTRODUCTION**

1.1 Overview of the Thesis

Teaching and learning in higher education around the world are being transformed to embed appropriate technologies and pedagogies suitable for a diverse range of students and teachers from multiple social and cultural backgrounds. Technology is a key player in today's higher-education environments with a huge potential to transform the future of university teaching and learning environments (Jeffrey 2009). It is important to research and conceptualize the latest technologies with reference to the appropriate pedagogies before introducing them into mainstream education. For the past two decades, mobile devices have found their way into formal and informal spaces of the teaching and learning community. Since mobile learning has surged in higher education as a silent revolution, there are pressing needs to research and conceptualize mobile learning to assist education providers and administrators to include mobile learning in mainstream education (Traxler 2009).

Current mobile learning literature indicates that most of the mobile learning theories and implementation trials are based on studies conducted in the developed world. However, developing countries are in need of mobile learning research as the increase in the number of mobile users and mobile technologies is significant, but these countries need to upgrade educational ICTs in order to progress (Barker, Krull, and Mallinson 2005). Traxler and Kukulska-Hulme (2005) identify a number of problems that impede the adoption of mobile learning in developing countries, such as the lack of uninterrupted power supply and poor computing facilities. Currently, there are several mobile learning conceptualizations for developing countries, and mobile learning pilot projects in India, Kenya and South Africa have shown positive results so far. Results of mobile learning studies in other developing countries were used to inform mobile learning research in Pakistani university environments.

This research will make a conceptual contribution to the mobile learning literature and pracitical contribution to the university enviornments in Pakistan. Conceptual

contribution will be made by developing a mobile learning framework for Pakistani universities which could also be generlized in other developing countries having similar university environments as of Pakistan. Practical contribution will include the recommendations for the key stakeholders within the university environments for future implementation of mobile learning in Pakistani universities. In Pakistan, to date, no mobile learning project has been implemented particularly in university environments; based on the researcher's 10 years experience and observation in university environment, there is lack of research in this area. Since a decade, Universities and Higher Education Commision of Pakistan have started allocating funds separately for research in innovative ways to capitalize on ICTs for university environments so that students would be trained in latest technologies and teachers may utilize ICT resources for teaching and research (PERN 2009; HEC 2009). Moreover, a rigorous literature search about mobile learning, mobile learning in developing countries and mobile learning in Pakistan did not yeild any publication revealing the implementation of conceptualization of mobile learning in Pakistani university environments. This research focuses on filling these gaps so that the research outcomes can assist Pakistani universities to upgrade educational Information and Communication Technologies (ICTs) and provide graduates with facilities and resources that meet international standards as well as add flexibility for the stakeholders in university teaching and learning enviornments.

1.2 Purpose of Research

The main purpose of the study is twofold; firstly, to conceptualize mobile learning for Pakistani universities and secondly to provide practical recommendation to the stakeholders in Pakistani university environments in order to make future implementation of mobile learning a success in Pakistani universities. The characteristics of mobile learning will be identified in terms of Pakistani universities and a mobile learning framework for these universities will be developed. To characterize mobile learning for Pakistani universities, important stakeholders such as students, teachers, administrators, instructional designers and IT managers from Pakistani universities will be invited to participate in the research. Mobile learning characteristics for Pakistani universities will be identified by using the perceptions

and expectations of these key stakeholders. The result of this research is a mobile learning framework and the stakeholders referred to in this resarch will be the beneficiaries of this work. The formation of a mobile learning framework for Pakistani university environments is indeed the theorization of mobile learning for Pakistani universities. Researchers would be able to use this model and associated recommendations to build upon for future research projects and studies.

In addition, this framework will provide the conceptual foundation for future research in mobile learning in Pakistani universities and other higher education institutions in other developing countries as well.

1.3 Definition of Mobile learning

Mobile learning -sometimes referred to as mlearning- has different meanings according to different schools of thought. A very basic definition, sometimes called a techno-centric definition of mobile learning, is '*any educational provision where the sole or dominant technologies are handheld or palmtop devices'* (Traxler 2005, 262). Winters (2007) identified different aspects of mobile learning with respect to defining and conceptualizing mobile learning including techno-centric, blending this with other learning spaces such as e-learning and traditional formal face-to-face learning, and knowledge creation by the learner who is proactive instead of just being a passive recipient of information.

1.4 Importance of Mobile learning

As e-learning constitutes a substantial part of the educational ICTs in modern higher-education environments, it has already become popular among the teaching and learning community around the world (Anderson 2008). E-learning offers flexibility and interactivity to the learners and educators beyond the limits of time and space. The adoption of e-learning by education providers around the world has revolutionized the education industry in recent decades. The popularity of e-learning extends to mobile learning as it not only inherits flexibility and interactivity from e-learning, but offers portability, connectivity, context sensitivity and collaboration

(Sharples, Taylor, and Vavoula 2010). Mobile learning is a step forward from e-learning as it provides a higher degree of flexibility in learning (Chao and Chen 2009; Low 2007; Peters 2009). Traxler (2005) argues that mobile learning is more spontaneous, portable, informal, bite-sized and interactive which makes it distinct from e-learning. Mobile learning research is needed to investigate how its unique attributes could contribute to the teaching and learning environments for different educational levels and settings.

Brown et al. (2008, 1) consider mobile learning as a window of opportunity for learning environments as it *'invite(s) the learning field to think 'out of the box' and take an evidence-based approach to exploring these capabilities'.* Furthermore, Oliver and Goerke (2007) argue that future university graduates can keep pace with technological advancements only if universities encourage them to be advanced digital learners by providing learning options on mobile devices and using social networking forums for learning. By having learning content made available on mobile devices, students and teachers can have flexible learning options while on the move. Students can download lecture slides, listen to podcasts, participate in class wikis and project blogs using their mobile devices (Akhshabi, Khalatbari, and Akhshabi 2011; Copley 2007; Lan and Sie 2010). The range of learning activities can be undertaken by students irrespective of time and location gives mobile learning a huge potential in future for the teaching and learning environments in future.

In Pakistani universities as well as universities around the world, a number of students bring their own mobile devices to the university campuses every day. In light of this development, universities could introduce a Bring Your Own Device (BOYD) policy to save enormous costs and redirect students' time spent merely on social networking activities to mobile learning activities. Cristol and Gimbert (2013) reported that students who brought their own devices to school for learning purposes, performed better academically than those who did not use mobile devices. Similarly, Song (2014) experimented using students' own devices in primary school in Hong Kong and found that students developed a better attitude towards seamless science exploration when they also used their mobile devices for learning, rather than just their textbooks. However, Stead (2014) and Smith et al. (2014) have recommended

that organizations and education providers need to establish their own customized BYOD policies before implementing this practice.

1.5 Mobile Learning and Education

The advent of sophisticated and user-friendly mobile devices with hundreds of thousands of compatible apps and faster access technologies (such as 3Gs and 4Gs) has already revolutionized industries such as banking, finance, travel planning, tourism, healthcare, social networking and entertainment. However, to date, education providers have been reluctant to use mobile technologies in formal teaching and learning environments and, thus, the education industry is far behind in adopting the mobile technologies and reaping the potential benefits on a larger scale. However, many top-ranking universities around the world have embraced mobile devices as an important and cutting-edge part of the educational ICTs (Brown, Metcalf, and Christian 2008; Hooft 2013; Keengwe and Bhargava 2013; Keskin and Metcalf 2011). In particular, researchers in developed countries such as USA, UK, Australia and a number of European countries have focused on implementing, theorizing and conceptualizing mobile learning. Mobile learning research projects such as Mobiled have demonstrated positive results in respect to learning objectives, learner's performance, motivation and effective use of learning resources beyond the limits of time and space (Pachler, Bachmair, and Cook 2010). Developing countries are even far behind in this persuit than developed world although mobile learning could become a possibility for developing countries to provide flexible learning options to their masses even in the backward areas.

1.6 Need for Mobile Learning Theory Building

Both in developed and developing world, mobile learning has been tested in trial implementations without having a solid theoretical stance of its own to inform the design of mobile learning research. Theory building and conceptualization of mobile learning have not yet been seriously considered by researchers (Sharples, Taylor, and Vavoula 2010; Traxler 2009). Mobile learning researchers have been using theoretical notions adapted from other learning fields, including traditional learning

and e-learning; however, Traxler (2009) stresses that mobile learning should be conceptualized distinctively and separately from other learning forms. Moreover, as Traxler (2009) argues that mobile learning is informal, spontaneous, bite-sized and just-in-time - attributes that makes mobile learning distinct from e-learning, traditional classroom learning and the other technologies available in higher education learning environments. Based on these built-in capabilities of mobile learning and to fill the major gap in theory building area of the current mobile learning literature, this research is an effort to theorize mobile learning for formal university environments in a developing country Pakistan.

1.7 Research Objectives and Questions

The study will focus on theorizing mobile learning for the Pakistani universities. Characteristics for mobile learning will be identified in the context of Pakistani universities and a mobile learning framework for universities in Pakistan, will be developed. The framework will assist students, teachers and administrative stakeholders to utilize mobile learning characteristics in universities in Pakistan and possibly other developing countries. In addition, this framework will provide the conceptual foundation for future research in mobile learning in Pakistani universities and other higher education institutions. The major objectives of the research are to:

- identify the characteristics for mobile learning in Pakistani universities' environment.
- investigate the perceptions and expectations of students, teachers and university administrators about mobile learning characteristics in Pakistani universities.
- develop a mobile learning framework for Pakistani universities.

Based on the research objectives, the following research questions have been framed in order to develop a mobile learning framework for Pakistani universities:

RQ1: What do the students perceive and expect of mobile learning in Pakistani universities?

RQ2: What do the teachers perceive and expect of mobile learning in Pakistani universities?

RQ3: What do university administrative stakeholders perceive and expect of mobile learning in Pakistan?

RQ4: What are the common mobile learning characteristics to consider when designing a mobile learning environment for Pakistani universities?

1.8 Significance of the Research

The outcomes of this research will contribute conceptually to the knowledge of the mobile learning field and in practical application it will reshape the way ICT is being used in university education in Pakistan. The mobile learning framework for Pakistani universities will provide guidelines for instructional designers and teachers when designing mobile learning activities and blending these with existing learning and teaching practices. The stakeholders will benefit from this research; in particular:

- Students will be engaged in learning process anywhere-anytime and utilizing their idle time for learning activities;
- Educational managers and IT managers will provide support to teachers and students;
- Educational administrators will be able to make decisions and direct resources by providing students and teachers with remote access to teaching and learning resources.

By introducing and promoting mobile learning, and endorsing up-to-date technology in education, universities can attract more students and ensure that the education they provide is up to international standards. A mobile learning framework can work as a blueprint for mobile learning project implementation and testing not only in Pakistan, but in other developing countries with similar needs for mobile learning in future.

1.10 Overview of Research Approach

For this research, a case study research method was chosen involving qualitative research techniques comprising focus groups and individual interviews. Focus group interviews were conducted with groups of students and teachers from selected Pakistani universities followed by individual interviews with a number of administrative stakeholders of the universities such as Deans of teaching and learning faculties, Head of the Departments, IT Managers and instructional designers. As there were no significant mobile learning theories and conceptualizations for Pakistani universities, this research is ground-breaking and exploratory in nature. In an exploratory case study approach, the researcher is able to study the problem situation through qualitative research techniques such as focus groups and interviews to enrich the research output (Yin 2009). The focus group is a qualitative research technique used to collect data through group interaction where the researcher provides the focus or theme and sometimes plays the role of moderator during discussions. Focus groups can be combined with individual interviews as one method complements the other in order to obtain a richer insight into the problem domain (Morgan 1997).

1.11 Acknowledgement for Published Work

It is important to acknowledge that several publications have been made out of different chapters and sections of this thesis. For instance, several publications including Imtinan, Chang, and Issa (2014), Imtinan (2013), Imtinan, Chang, and Issa (2013a), Imtinan, Chang, and Issa (2012a), Imtinan, Chang, and Issa (2012b), Imtinan, Chang, and Issa (2011), Imtinan, Chang, and Issa (2010) and Imtinan (2010) arose from litertature review and research methods chapters of the thesis. One conference paper was published out of results and findings of students' focus groups or chapter 4 of the thesis (Imtinan, Chang, and Issa 2013c). Another conference paper was published out of chapter 6 (Imtinan, Chang, and Issa 2013b). A detailed list of publications out of this theses can be reviewed on page ix of the thesis.

1.12 Thesis Outline and Structure

This section outlines the thesis organisation. This thesis has been organized in eight chapters. Details of theis organization and chapters are as follows:

- The introductory chapter provides an overview of the study and thesis organization.
- A comprehensive and critical review of extant literature in the mobile learning field will be presented in Chapter 2.
- After the literature review, the research methodology chapter contains a detailed account of methodological alternatives and the methodology chosen as the most appropriate for this research. Chapter 3 also contains information about data collection techniques, participant demographics, data analysis strategies, data analysis tools, data analysis stages and ethical considerations for this research.
- Chapters 4, 5 and 6 include results, discussion and findings from the analysis of students' focus groups, teachers' focus groups and individual interviews from administrative stakeholders in universities.
- Chapter 7 presents a new mobile learning framework, theoretical and practical contributions of this research into knowledge-base and answers for the research questions.
- Chapter 8 includes conclusions, recommendations and future research directions followed by references and appendices.

1.12 Chapter Summary

Mobile learning is a new addition to the realm of teaching and learning via technologies. Many industries such as banking, finance and tourism have already added mobile devices to their routine business practices. The education sector is embarking on adapting this innovation to formal teaching and learning practice as many universities in developed countries have already included mobile devices in their formal educational technologies. Unlike the other industries, the education sector needs research into and theorization of mobile learning in order for it to be successfully integrated into formal learning environments and to harness its potential

benefits. This research is an effort to theorize mobile learning for a developing country, Pakistan. Using the case study research method, qualitative research techniques are used to collect and analyze data. The outcomes of the research will contribute conceptually to advancing the body of knowledge in the field of mobile learning and will provide practical assistance to reshape the way technology is used in university environments in Pakistan.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Mobile learning has been in practice in multiple contexts, including formal and informal learning spaces (Pachler, Bachmair, and Cook 2010; Pachler, Cook, and Bachmair 2012). The term 'mobile learning' was coined in the late 1990s, when advancements in smart phones and mobile devices gave mobile learning researchers new opportunities to run mobile learning pilot projects (Kukulska-Hulme and Traxler 2005; Ozdamli 2012). The idea of mobile learning is not new; nor did it emerge only with the advent of smart phones. As Laurillard (2007) argues, the idea of a printed book was the beginning of mobile learning as it introduced the concept of mobility in learning; and now, the device is replaced by smart phones or tablet mobile devices used by today's learners (Vavoula, Pachler, and Kukulska-Hulme 2009).

A review of the extant mobile learning research literature shows that researchers may have borrowed the theoretical stance from other disciplines such as Education, Engineering, Information Systems and Human-Computer Interaction, with already-established theoretical bases (Kukulska-Hulme and Traxler 2005). However, the development of mobile learning theory is also under way as a number of researchers have proposed theories and conceptualizations of mobile learning in the form of frameworks and models (Keskin and Metcalf 2011; Ozdamli 2012).

In the case of mobile learning theory development, there are a number of challenges other than just adapting learning theories from already-established disciplines. As Traxler (2009) states, mobile learning theorists and researchers should consider the scalability of mobile learning implementations and blend mobile learning with other forms of learning. Previously, mobile learning researchers were focusing only on differentiating technology-oriented mobile learning from pedagogy-oriented mobile learning. Traxler (2009) further argues that mobile learning theorists should

carefully test the adaptation of theories from other disciplines such as Education, Information Systems, Engineering and Human Computer Interaction – together with the contributions of mobile learning's unique characteristics in order to come up with the mobile learning theories to be generalized on a large scale.

It is important to point out from the outset that different mobile learning studies may have used different terminology for the same mobile learning characteristics. For example, 'mobility' and 'flexibility' have been used interchangeably in many studies; the same goes for 'connectivity' and 'network access point' in the same context (Frohberg, Göth, and Schwabe 2009; Koole 2009). Therefore, similar characteristics have been grouped under the one name or terminology predominantly used in the literature to represent each concept and have been used in the subsequent sections of this chapter and the rest of the thesis in order to maintain consistency and avoid confusion for the reader.

This chapter has been organized according to the following sections. The scope of the literature review is discussed in Section 2.2. Section 2.3 contains the discussion of various mobile learning definitions. In Section 2.4, a review of theoretical perspective has been presented. Sections 2.5 presents a detailed account of mobile learning models and frameworks from the extant literature followed by mobile learning characteristics individually discussed in Section 2.6. Section 2.7 and Section 2.8 examine mobile learning in developed and developing countries and provide a summary of mobile learning studies in developing countries. Section 2.9 identifies the gaps in the existing literature that this research aims to address, and Section 2.10 presents an initial mobile learning model based on the literature review followed by the chapter summary.

2.2 Scope of the Literature Review

For the purpose of a comprehensive literature review, certain topics in particular were included in this chapter: mobile learning definitional aspects, mobile learning theoretical perspectives, existing mobile learning studies proposing models and frameworks, mobile learning characteristics incorporated in those studies and the current state of mobile learning in developing countries. A number of scholarly

databases were examined including Science Direct, ACM Digital Library, Proquest (ABI-INFORM) and SpringerLink. Further, several internationally reputed journals which regularly publish mobile learning research, were consulted manually. Some of these journals include: International Journal of Mobile Learning and Organizations, International Journal of Mobile and Blended Learning, Computers and Education, Journal of Computer Assisted Learning and British Journal of Educational Technology.

Since there are relatively few research articles that focus in particular on the conceptualization of mobile learning, the proceedings of a few popular conferences such as the MLearn series and IADIS Mobile Learning conferences were also examined. Most important of all, approximately 25 to 30 of the latest books published on the topics of mobile learning, online learning, e-learning, blended learning and technology in learning were read and consulted manually; a number of book chapters from these books have been referenced in this chapter and the rest of the thesis. The list of books includes, but is not limited to mobile learning are:

- Mobile Learning: essays on philosophy, psychology and education by Kristóf Nyíri (2003)
- Mobile learning: a handbook for educators and trainers by Agnes Kukulska-Hulme, John Traxler (2005)
- Mobile Learning: Transforming the Delivery of Education and Training by Mohamed Ally (2009)
- The theory and practice of online learning by Terry Anderson (2008),
- Innovative mobile learning: techniques and technologies by Hokyoung Ryu and David Parsons (2009)
- Researching Mobile Learning: Frameworks, Tools, and Research Designs by Giasemi Vavoula, Norbert Pachler, Agnes Kukulska-Hulme, (2009)
- Mobile Learning: Structures, Agency and Practices by Norbert Pachler, Ben Bachmair, John Cook, Gunther Kress (2010)
- Mobile Technologies and Handheld Devices for Ubiquitous Learning: Research and Pedagogy by Wan Ng (2011)
- Appropriation of Mobile Cultural Resources for Learning by Norbert Pachler, Ben Bachmair, John Cook (2012)
- Innovations in Mobile Educational Technologies and Applications by David Parosns (2013)

- Mobile Pedagogy and Perspectives on Teaching and Learning by McConatha et al. (2014)

The above mentioned literature sources from 2000 to 2012 were scanned for the terms mobile learning models and frameworks, mobile learning conceptualization, mobile learning theories, mobile learning characteristics, mobile learning in developing countries and mobile learning research methods. The initial search of online databases yielded approximately 700 articles using these keywords. Abstracts of all of the downloaded articles were scanned manually for relevance. Approximately 300 articles were selected for inclusion in this literature review based on their relevance to the topic of this research. As the mobile learning field is encountered by numeruous studies and research projects each year resulting in a number of new publications and developments in the field. Therefore, a number of scholarly articles from books and journals published in 2013 and 2014 have also been included in order to reflect the latest happenings and trends in the field of mobile learning.

2.3 Definitional Aspects of Mobile Learning

As indicated by the literature, early definitions of mobile learning are somewhat influenced by advanced mobile technologies, and therefore represent a techno-centric view (Traxler 2005). More recently, the concept of mobility in learning has been redefined with respect to the digital and mobile technologies governing the social and personal spaces of a learner's life, as explained by Pachler et al. (2010, 6):

> *'Definitions of mobile learning in the literature are manifold, but they tend to revolve around the mobility of the technology or the mobility of the learner with a clear change of emphasis of late from former to the latter.'*

Therefore, it was noted that mobile learning has shifted the focus from technology to mobility. Another important aspect of mobile learning has been entertained by a number of researchers in the definition space of mobile learning and that is to illustrate the orientation of mobile learning with learning theories (Ally 2004). This aspect is of substantial importance in the growth and acceptance of mobile learning by education providers as they can be convinced to allow mobile learning into formal

and mainstream education only if they find enough evidence that traditional learning and cognitive theories not only support mobile learning but also demonstrate better results in terms of learning and innovation (Palfrey and Gasser 2008). The following sub-sections provide detailed information from the literature about the three definition perspectives identified in this section; viz., techno-centric, learner-centred and augmentation of learning theories with mobile learning.

2.3.1 Techno-Centric

Mobile learning is a way to learn, independent of time and space, by virtue of the advancement in mobile technologies (Ally 2009; Kukulska-Hulme 2005a). O'Malley et al. (2003, 6) defined mobile learning as:

> *'Any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of learning opportunities offered by mobile technologies.'*

Similarly, Keegan (2005, 3) defines mobile learning as:

> *'The provision of education and training on PDAs/palmtops/handhelds, smart phones and mobile phones.'*

> *'Mobile technologies and devices tend to change rapidly; therefore, when defining mobile learning, it is necessary to think beyond a specific mobile device and a particular mobile technology.'*

The importance and role of mobile technologies, however, cannot be denied. Traxler (2009, 14) has called mobile technology the *'defining characteristic of mobile learning'.* Popular usages, pervasive access, portability of devices and cheaper prices of mobile technologies available to the common man have expanded the number and range of learning opportunities. The introduction of mobile technologies and mobile devices has redirected learning to "finding information rather than possessing it or knowing it" which provides equal opportunity for members within a community or society to access learning resources. Furthermore, the affordability of

mobile technologies has introduced the concept of connectedness of the society in particular, and a connected world in general (Denk, Weber, and Belfin 2007; Traxler 2009).

2.3.2 Learner-Centred Mobility

Pachler et al. (2010, 6) define mobile learning from the social perspectives of the learner and state this clearly as follows:

> *'Mobile learning - as we understand it - is not about delivering content to mobile devices but, instead, about the processes of coming to know and being able to operate successfully in, and across, new and ever-changing contexts and learning spaces. And, it is about understanding and knowing how to utilize our everyday life-worlds as learning spaces. Therefore, in case it needs to be stated explicitly, for us mobile learning is not primarily about technology.'*

Literature suggests that the popularity of mobile learning is not merely due to more advanced technology and extensive use of mobile devices but, rather, the concept of mobility and learning has suggested the possibility of using mobile technologies in learning environments. Vavoula and Sharples et al. (2002) discuss learning as a dynamic process because individuals learn, and they are capable of learning, even when not in formal academic settings. Laurillard (2007) mentions that the very concept of mobility has been built into learning environments since the advent of printed books, pencils and notebooks; learning has been mobile in different spheres of life; and it is the technology that is ever-changing. Today, a mobile device combines the benefits of a book (eBooks and other electronically published material), a pencil (word processing capabilities), notebooks (note-taking software applications) and numerous other features for the learner to enjoy the greater benefits of mobility.

Mobile learning has scope for individual, collaborative and situated learning. It is a ubiquitous learning solution which inherently combines the benefits of existing learning domains such as e-learning, in-person learning and contextual learning (Frohberg, Göth, and Schwabe 2009; Sharples, Taylor, and Vavoula 2005). In

general, learning occurs at different times during the day, and it is mobile in terms of space as it happens in the workplace, at home and at places of leisure. Furthermore, learning is 'just-in-time' as discussed by Kambil and Eselius (2000), no matter what you do or where you are. It is mobile between different areas of life such as work demands or self-improvement. Learning is continuous improvement gained through life-long practice of knowledge and skills. Mobile learning cannot be separated from face-to-face learning and e-learning (Sharples, Taylor, and Vavoula 2005; Vavoula and Sharples 2002). Mobility empowers the learning process by redefining traditional and formal learning to informal, contextual and lifelong learning.

2.3.3 Augmenting with Learning Theories

Mobile learning is not just about advanced technology. As Litchfiled et al. (2007) have discussed, there is great confusion among teachers and administrators regarding the use of mobile devices in learning environments. Mifsud (2002a, 1) points out that dilemma is being faced also by education providers as to whether this 'technological intruder' should or should not be allowed in universities. However, Palfrey et al. (2008) argue that teachers and educational authorities should allow the use of mobile technology in education and should design learning activities conforming to pedagogical principles. Motiwalla (2007) discusses mobile learning from the perspective of learning theories such as social constructive theory of learning and conversation theory.

According to Naismith, et al. (2004b), mobile technologies enable people to learn and reflect in certain environments conforming to the social constructive theory of learning. Also, mobile learning provides enhanced collaboration and interactivity among learners and teachers, thereby achieving the benefits of conversational learning. Sharples, Taylor, and Vavoula (2007) define mobile learning as a conversational learning process when people move to different places and use different technologies for the purpose. Laurillard's (2007) conversational framework for learning also supports mobile learning. Naismith et al. (2004b) have categorized theories of learning as behaviourist, constructivist or collaborative, to explain how mobile learning is supported by a number of learning theories.

Rochelle (2003) argues that when it comes to using mobile devices for learning, the nature of learning will be changed to the conversational and collaborative as will be the representation of the learning resources. He further comments that mobile devices provide teachers and students with another opportunity to socially communicate and collaborate besides the classroom. Traxler (2009) discusses that the popularity of mobile technologies and devices has made it imperative to explore and redefine the complex relationship between learner, society and technologies. He argues that mobile learning - with some distinguishing characteristics (see Section 6 for details of mobile learning characteristics) of its own - resides more in the realm of informal learning than formal learning; therefore, the conceptual and theoretical stance of mobile learning may be distinct from other forms of learning.

Pachler et al. (2010, 19) refer to Vygotsky's theory of child development, which considers that a child or learner has different 'zones of proximal development' (ZPD) where the environment is more conducive to learning; these ZPDs are not necessarily formal educational premises such as classrooms and schools; rather, a learner's 'responsive phases' may include socio-cultural backgrounds and spaces such as home, community and playground. Pachler et al. (2010) emphasize that the concept of ZPD needs to be redefined with respect to mobile learning, which provides the opportunity for learning across contexts and without the limitation of formal institutional boundaries and timings. A number of mobile learning researchers have used activity theory (Vygotsky 1978) and activity system (Engeström 1987) as theoretical foundations for mobile learning research.

It may be concluded that mobile learning is not merely an outcome of technological advancement; rather, it has been augmented with learning theories as a pedagogical stance. It also considers the learner to be more independent as well as collaborative in the learning process. These arguments may pave the way for education providers to include mobile learning in mainstream education, blending it with other existing forms of learning. Current literature about mobile learning definitions, however, lacks the inclusion of pedagogical aspect in rigourous way to make mobile learning defintions stronger and complete in variety of educational arenas.

2.4 Theoretical Perspectives of Mobile Learning

A number of mobile learning researchers have discussed the ZPD of Vygotsky (1978) as one of the mobile learning foundational theories (Liaw, Hatala, and Huang 2010; Sharples, Taylor, and Vavoula 2005; Uden 2007). Although there is no consensus in the field of mobile learning regarding foundational theories, researchers are experimenting with multi-disciplinary theoretical foundations for a variety of mobile leaning research projects across the world (Traxler 2009). This is a process of natural evolution and growth for a new field of knowledge, although sometimes it takes centuries for a knowledge base to become enriched with established theories (Pachler, Bachmair, and Cook 2010; Vavoula, Pachler, and Kukulska-Hulme 2009). A significant attempt to define the theoretical perspectives of mobile learning was made by Naismith et al. (2004b) who categorized mobile learning from the theoretical perspectives of learning on the basis of learning activities such as behaviourist, constructivist, situated, collaborative, informal and lifelong learning. The theoretical perspectives identified by Naismith et al. (2004b) became very popular among mobile learning researchers.

Many mobile learning researchers have cited and used theoretical perspectives by Naismith et al. (2004b) as a foundation for their own research studies and projects (Herrington and Herrington 2007). By using existing learning theories, Naismith et al. (2004b) have populated emerging learning practices by today's learners and justified how mobile learning is oriented towards existing learning theories while addressing the new and unique needs of today's learner who is born as a digital native (Palfrey and Gasser 2008).

Keskin and Metcalf (2011) included a number of theoretical perspectives popular among mobile learning researchers such as context awareness, socio-cultural theory, conversational learning and problem-based learning in addition to the perspectives presented in Naismith et al. (2004b) (Laurillard 2007; Pachler, Bachmair, and Cook 2010). Furthermore, there are a number of other theories underlying the experimentations of mobile learning researchers including, but not limited to, the theory of planned behavior, self-regulated learning and the Technology Adoption Model (Chen et al. 2011; Chen 2009; Cheon et al. 2012). The concept of mobile

learning as micro-learning has also been discussed by several researchers (Hug 2012; Oliver 2007).

Despite the numerous and various theoretical perspectives explored and presented by mobile learning researchers discussed in earlier paragraphs of this section, there are several aspects of mobile learning that still need to be discussed from a theoretical stance. For instance, Traxler (2009, 10) argues that mobile learning has multiple novel dimensions that must be considered by researchers of mobile learning:

> *'Attempts to develop the conceptualizations and evaluation of mobile learning, however, must recognize that mobile learning is essentially personal, contextual, and situated; this means it is 'noisy', which is problematic both for definition and for evaluation.'*

These novel dimensions indicate the need for further research in order to develop definitions for mobile learning distict from eLearning and other forms of learning. Furthermore, the theoretical perspectives borrowed from other diciplines and other forms of learning need to be reconsidered and researched again in order to adapt them for mobile learning research and implementation in mainstream education.

2.5 Review of Current Mobile Learning Frameworks and Models

This section presents a discussion on the theorization and conceptualization of mobile learning by mobile learning researchers who have proposed their models and frameworks. However, these models and frameworks are theory-informed as these researchers have taken a strong theoretical stance based on those of other disciplines including Education, Information Systems, Engineering and Human Computer Interaction (Calbraith and Dennick 2011; Kukulska-Hulme 2009).

Activity theory has been quite popular among mobile learning researchers in informing mobile learning research designs (Petrova 2010; Uden 2007). Other than activity theory as a theoretical basis for mobile learning research, a number of researchers have formulated models and frameworks derived from mobile learning

action research projects, trial implementations and theoretical reviews. Most of these frameworks and models incorporate mobile learning characteristics such as usability, engagement, interactivity, collaboration, context and mobility. These characteristics -also referred to as the criteria for mobile learning design by some researchers- have been used by mobile learning researchers to theorize mobile learning for a variety of learning environments from elementary schools to higher educational institutions and across multiple disciplines. Figure 1 has been derived from the mobile learning characterisitics found in the mobile learning literature in order to portray what other researchers have emphasized upon in mobile learning literatrure.

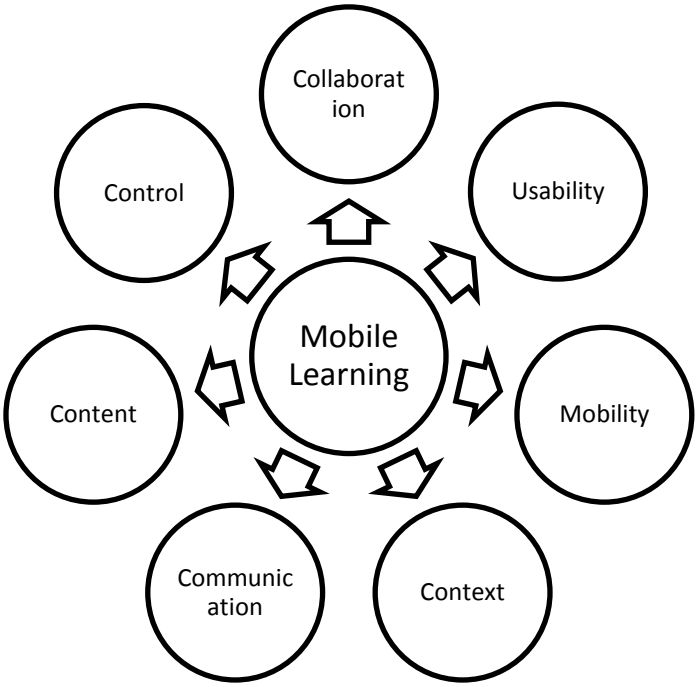


Figure 1: Key Characteristics of Mobile Learning

The key characteristics of mobile learning (see Figure 1) which have emerged from the literature include: usability, collaboration, communication, context, content, control (authenticity/ administrative checks and teacher's control on learning process), mobility (sometimes referred as flexibility), portability, interface and availability of mobile learning applications (Barker, Krull, and Mallinson 2005; Danaher, Gururajan, and Baig 2009; Denk, Weber, and Belfin 2007; Frohberg, Göth, and Schwabe 2009; Chao et al. 2009; Koole 2009; Naismith et al. 2004b; Parsons

and Ryu 2009). The mobile learning models and frameworks in this section have been discussed with respect to the mobile learning characteristics incorporated in them. These models and frameworks were reviewed for inclusion in this section. However, the most relevant models and frameworks were selected to address the research aims and objectives based on the frequency with which they are citerd in the literature. A list of mobile learning models and frameworks has also been presented in Table 1 towards the end of this section.

Barker et al. (2005) have proposed a model (See Figure 2) for mobile learning adoption in developing countries. According to Barker et al. (2005), the main players in a mobile learning environment include a communication infrastructure, learners, teachers and IT staff. Parents, system designers and device vendors play an indirect role outside of the system entities.

A key component of Barker's model is the issue of policies and guidelines for mobile learning. These policies and guidelines may ultimately play a key role in mobile learning instructional design which can lead to acceptance of mobile learning in mainstream education by education providers.

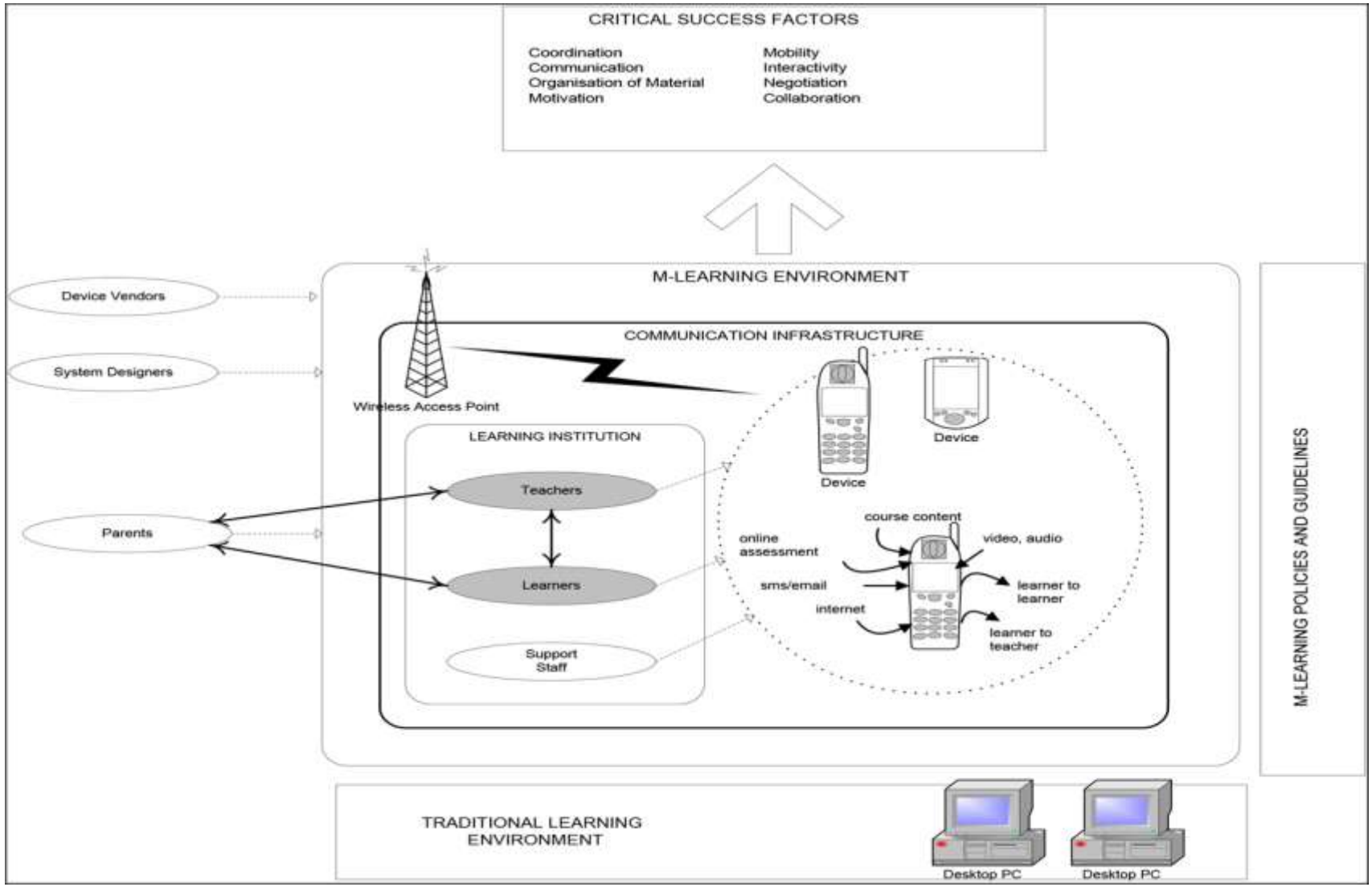


Figure 2: A model for M-learning adoption (Barker, Krull, and Mallinson 2005)

Sharples, Taylor and Vavoula (2005) used the activity theory of Engeström (1987) to formulate a theory of mobile learning and presented an adapted version of Engeström's activity diagram for analyzing mobile learning environments, named the 'task model for mobile learning'. The 'task model for mobile learning' (Taylor et al. 2006) (See Figure 3) provides an analytical framework and design rationale for mobile learning using subject, tool, control, context, communication and object as an adaptation of the original components of the activity system.

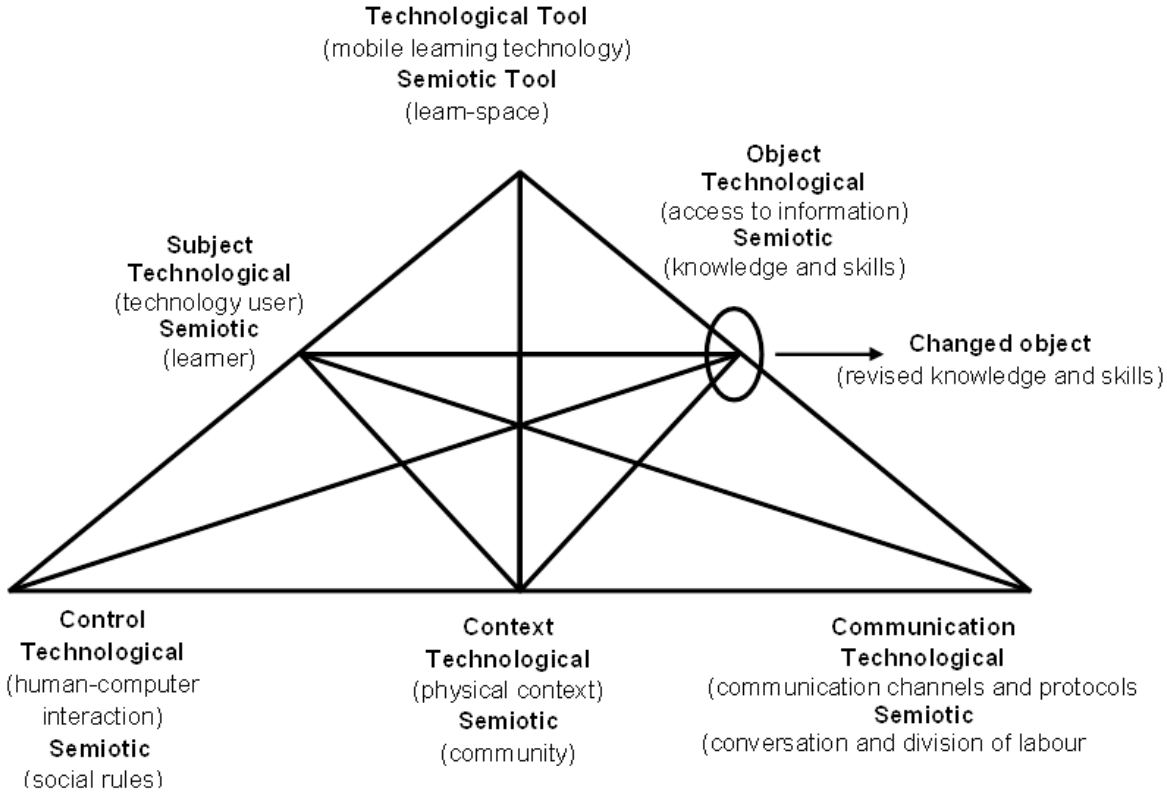


Figure 3: Task model for mobile learning (Taylor et al. 2006; Sharples et al. 2007b)

In line with the model shown in Figure 3, the mapping for each component has been included in the model:

1. Subject refers to mobile learners.

2. Tool is device or means that assists the learner or helps mediate the learning process, for example, mobile devices and technologies are tools in the case of mobile learning.

3. Context refers to the physical environment of the learner or where the learning takes place: a mobile learner would be able learn in a variety of contexts due to the mobility of the technology Control represents rules in the activity system: how the learning process is mediated or controlled by teachers, administrators and learners.

4. Communication demonstrates the level of collaborative work and interactive learning between the learner, the teacher, peers and other stakeholders in the learning environment.

5. Objective is the learning outcome and assessment of improvement in acquired skills and enhanced knowledge.

Frohberg et al. (2009) have used Taylor et al. (2006) task model as an analysis framework to categorize different mobile learning studies by mobile learning researchers around the world. This mapping validates the notion of activity theory for mobile learning as an inherent framework. The adaptation of the activity theory for mobile learning by a number of researchers has made it a key theoretical foundation for mobile learning research. Uden (2007, 99) analyzes activity theory for designing mobile learning environments and concludes that '*activity theory can help designers to better understand the social and material relations that affect complex human learning and learners' interaction with others as mediated by tools'.* Uden's framework (no figure available, a multi-step process) analyzes and maps the activity theory to mobile learning activities by introducing a number of steps such as understanding the purpose of the learning activity, designing an interface to perform that activity, ensuring the relevance of the context where learning is happening, understanding of activity structure and investigating possible contradictions within the learning environment itself. Every step poses a number of questions addressing detailed criteria for mobile learning design including engagement of learners, collaborative activities, learning across multiple contexts, available resources, role of technology, expectations of learners and potential contradictions in dealing with mobile learning design to blend with other modes of learning.

Motiwalla (2007) presented a comprehensive mobile learning framework (see Figure 4) that includes the concepts of isolation and interaction in relation to the type of mobile learning applications and access technologies.

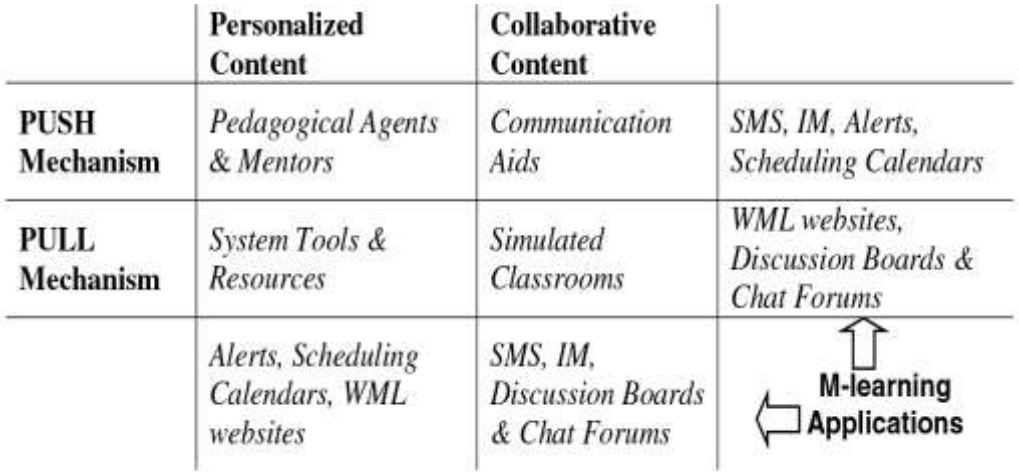


Figure 4: A mobile learning framework (Motiwalla 2007)

Motiwalla's framework has been researched in terms of pedagogical considerations for mobile learning. Motiwalla's (2007) framework uses the mobile learning content-type to illustrate mobile learning characteristics, technological resources and the role of teachers and administrators. Personalized and collaborative learning have been included as key themes to demonstrate that the learner can fully utilize the benefits of mobile learning as an independent learner and as a member of a peer-group. Mobile learning applications such as SMS, instant messaging, calendars, discussion boards and chat forums are appropriately designed to match pedagogical expectations.

Another mobile learning framework (see Figure 5) developed by Danaher et al. (2009) demonstrates how to design mobile learning environments for higher education.

Engagement, presence and flexibility have been proposed as fundamental and driving characteristics for mobile learning for higher education in Danaher et al.'s (2009) conceptual framework for designing mobile learning environments. Each of the characteristics employed in this framework is equally important in the mobile

learning environment; thus, it is important to consider these components when designing mobile learning environments for university students.

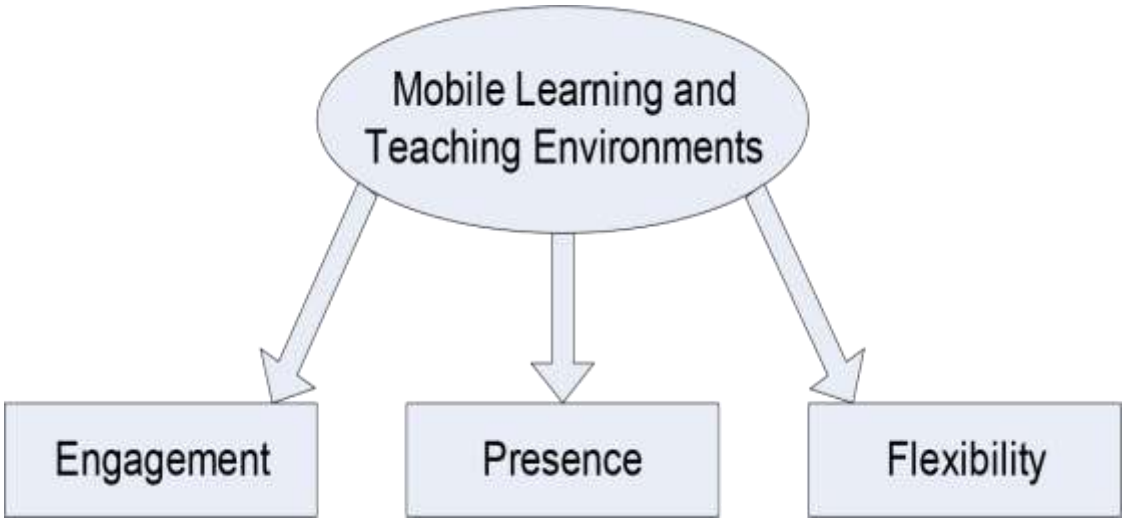


Figure 5: A conceptual framework for designing mobile learning environments (Danaher, Gururajan, and Baig 2009)

'Engagement' is related to the collaboration between learners and their mentors or teachers. 'Presence' refers to the physical context and enhanced awareness of the learning environment. 'Flexibility' reflects one's ability to be involved in learning activities regardless of time and space. All three components combine to create an optimal opportunity for the mobile learner to achieve learning goals (Danaher, Gururajan, and Baig 2009).

As shown in Figure 6, Parsons and Ryu (2009) formulated a framework that guides the design process of mobile learning activities. Most importantly, the components of this framework take into account the nature of mobile devices, learning context of these devices, possible learning activities and most important of all, the learning objectives.

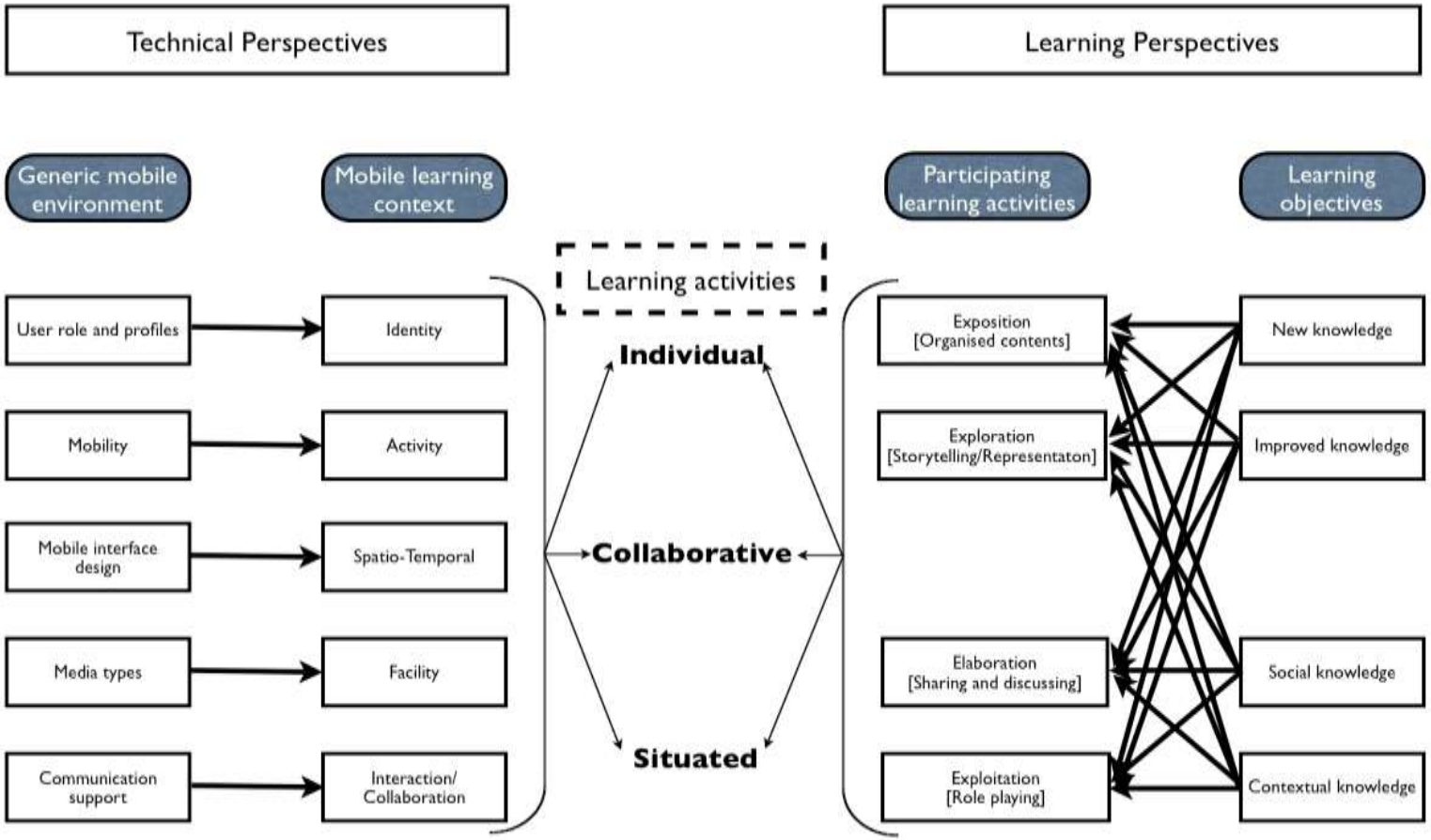


Figure 6: A framework for designing learning spaces (Parsons and Ryu 2009)

By including learning objectives, mobile learning is actively evaluated. Learning activities have been categorized as individual, collaborative or situated. These learning activities, considered from both the technical and learning perspectives, include types of mobile devices, mobile learning context, participatory learning activities and learning objectives.

Koole (2009) has formulated a Framework for Rational Analysis of Mobile Education (FRAME) (see Figure 7) with three main aspects of: 1) the device aspect representing mobile devices and mobile technologies, 2) the learner aspect referring mainly to the learner, and 3) the social aspect indicating other participants in the learning community who influence the learning process directly and/or indirectly.

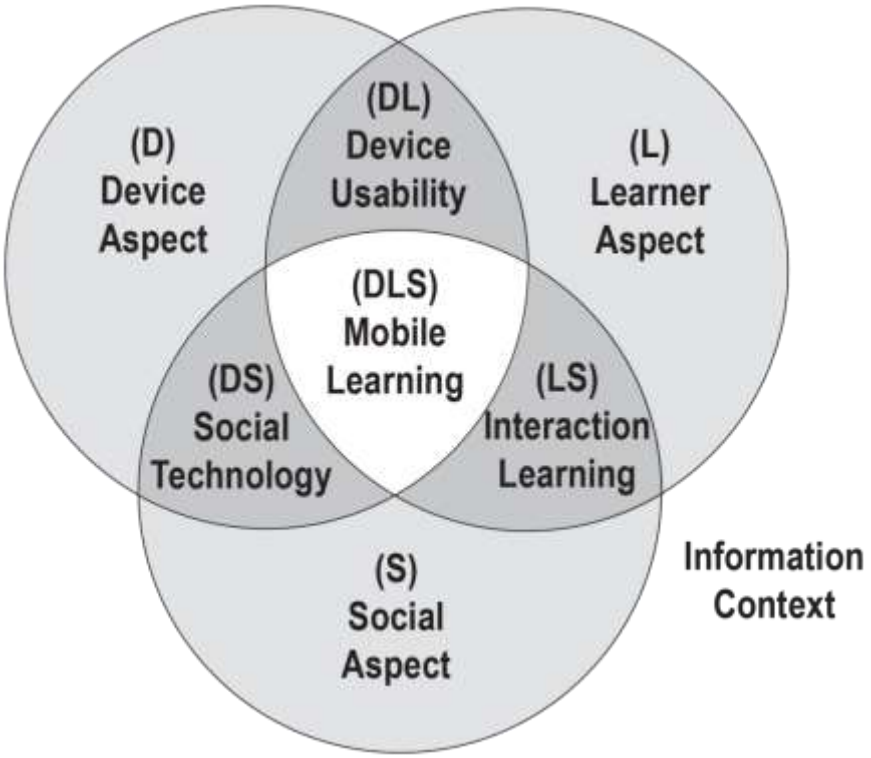


Figure 7: The FRAME model (Koole 2009)

In this model, the mobile technologies mediate the learning process for learners, facilitate social interaction within the community of learners for collaborative projects, and enhance learning outcomes. For each aspect, the FRAME model encapsulates in detail the characteristics such as device features, portability, and

motivation, learners' prior knowledge about mobile technologies, device usability issues and collaborative tools.

Table 1: Summary of Mobile learning Models and Frameworks in Literature

Model/Framework	**Authors**
Pedagogical Framework of Mobile Learning	(Ozdamli 2012)
A scalable framework to quantitatively evaluate success factors of mobile learning systems	(Issa, Al–Bahadili, and Abuhamdeh 2011)
Mobile Learning Framework for Lifelong Learning	(Nordin, Embi, and Yunus 2010)
The Framework for the Rational Analysis of Mobile Education (FRAME)	(Koole 2009)
The Framework for designing m-learning environments	(Danaher, Gururajan, and Baig 2009)
The Framework for designing mobile learning spaces	(Parsons and Ryu 2009)
The Framework for collaboration in context	(Spikol, K., and M. 2009)
Framework to integrate m-learning into e-learning	(Wains and Mahmood 2008)
An Interactive M-Learning Model	(Wei, Zhuo, and Zhang 2008)
Framework for analysing mobile learning	(Wali, Winters, and Oliver 2008)
A framework for enabling on-demand personalixed mobile learning	(Meawad and Stubbs 2008)
A framework for designing mobile learning	(Uden 2007)
Conceptual framework for mobile CSCL	(Zurita and Nussbaum 2007)
Australian Flexible Learning Framework	(Low 2007)
the conceptual framework for m-learning design requirements	(Barbosa et al. 2007)
Task model for mobile learning	(Sharples, Taylor & Vavoula 2007b)
Mobile Learning Framework	(Motiwalla 2007)
A proposed theoretical model for m-learning adoption in developing countries	(Barker, Krull, and Mallinson 2005)
Low-Key m-learning: a realistic introduction of m-learning to developing countries	(Masters 2005)

As it is not possible to discuss all available mobile learning models and frameworks individually, only the most relevant and prominent models/frameworks have been discussed in detail. Table 1 provides a summary of a number of popular and

frequently-cited mobile learning models and frameworks available in published mobile learning research.

2.6 Mobile Learning Characteristics

Current mobile learning literature shows that mobile learning researchers have been experimenting on a number of mobile learning characteristics (Cobcroft 2006; Danaher, Gururajan, and Baig 2009; Frohberg, Göth, and Schwabe 2009; Koole 2009; Kwon and Lee 2010; Ozdamli and Cavus 2011; Parsons 2013; Traxler 2009). After the rigorous process of scanning and reviewing literature for this study, it was concluded that usability, collaboration, context, control, connectivity, mobility, content, blending, technical support and cost are the common mobile learning characteristics. It appears from the literature that these characteristics have been incorporated and researched in one way or another in most of the mobile learning studies dealing with the subject so far. The following sub-sections contain the discussion of each of these mobile learning characteristics in detail.

2.6.1 Usability

Usability relates to the ease of using mobile devices for learning purposes in respect to screen size, battery life, size, weight, memory, processing power, compatible applications and user interface (Koole 2009; Kukulska-Hulme 2005b). Other than these basic usability issues, Koole (2009) includes a number of other factors such as aesthetic appeal of the device, simplified display, fewer steps required to perform a task, ease of navigation, customization options and environment or climate of the place where the learner is located. Besides the usability features of mobile devices, Kuen (2006) provides a usability guidelines framework for designing mobile learning portals which focuses on analyzing the learner's usage skills, human-mobile interaction and interface design as main categories to develop usability guidelines for designing mobile learning portals containing mobile learning content and applications. Bearing in mind the fact that current mobile devices, and the ones used in previous pilot projects such as PDAs and smart phones, are not built for learning purposes, it is more likely that learners will face usability problems. Therefore, researchers such as Kuen (2006) recommended guidelines for designers of mobile

learning portals. However, as the mobile devices are becoming multi-purpose and more sophisticated in design and functionality, the basic usability problems such as battery life, memory capabilities and screen size limitations, will diminish (Wu et al. 2012).

2.6.2 Collaboration

Collaboration demonstrates the level of communication and interaction between the learner and the teacher as well as among other learners (Ryu and Parsons 2009). A number of studies around the world have shown that mobile learning will make learning processes more informal and collaborative (Mifsud 2002). Collaboration in learning has been proven to enhance learning outcomes. Parsons et al. (2009) argue that collaborative learning gives a better understanding of the subject matter to all contributors or group members and this in itself is a good reason for accepting mobile technologies in learning environments. Palfrey et al. (2008, 248) relate mobile technologies to collaborative learning because the former can be utilized the best in order to reap the benefits of 'team-based learning'. Spikol et al. (2009, 174) refer to Piagetian theories of collaborative learning based on 'conversations that can result in cognitive restructuring' and Vygotskian views about 'peer-to-peer interaction' which facilitate knowledge sharing and knowledge creation. Mobile learning encourages collaboration among learners, teachers and other stakeholders in learning environments (Barker et al., 2005). A number of mobile learning projects have been implemented around the world showing improved learning outcomes by students when engaged in a range of collaborative activities including field work, group projects and classroom activities. Furthermore, most mobile learning theorists in the current literature have included collaboration or collaborative learning activities as one of the driving factors in the adoption and/or acceptance of mobile learning by education providers at the elementary school level, college level or university level (Danaher et al. 2009; Ford and Leinonen 2009; Motiwalla 2007).

2.6.3 Context

Context refers to the physical environment of the learner or where the learning takes place (Frohberg et al. 2009). Mobile learning presents learners with a variety of

contexts where they can learn and experiment in real-world situations (Geddes 2004). Learners can interact with the environment and make sense of the objects with location awareness of mobile devices such as museum tours; an example is the Tate Modern Multimedia Tour pilot project and MobiLearn project where learners experienced contextualized learning using mobile devices during the tour that provide information about objects on display(Attewell et al. 2003; Proctor and Burton 2003b). A study by Chen et al. (2003) reporting on the observation of birds on a farm is another example of context in the mobile environment where students, on a field trip, learn about birds by observing the physical activities of birds and use mobile devices to record information and identify objects. The context of the learner can be a classroom or any other controlled learning environment such as a mobile learning study conducted by Lowery (Lowery 2005) where a teacher uses a quiz in the classroom and relies on responses from the students to proceed with the learning session. Spikol et al. (2009, 174) discuss context in relation to collaboration for mobile learning and define context as *'information and content in use to support a specific activity (being individual or collaborative) in a particular physical environment'*. In mobile learning, the context of the learner is a key construct as mobile devices allow the learner to access, navigate and make sense of information where and when it is needed.

2.6.4 Control

Control refers to the amount of grip a teacher or a learner has on the learning process for smooth continuity and best outcomes (Frohberg et al. 2009). When designing mobile learning environments, it is very important to emphasize the role of the moderator who mediates the learning process, controls it to a certain extent and creates the learning environment which nourishes learners with guided reflection; otherwise, learners may be at risk of losing direction (Sharples et al. 2005). As a theoretical foundation for their mobile learning research, Herrington et al. (2009) discuss the concept of authentic learning where students are able to resolve real-time complex problems in professional environments and by reflection create new knowledge, at times guided by teachers. The teacher's role and intervention in the learning process is of vital importance. Pachler et al. (2010, 160) refer to *'the conversational framework for supporting the formal learning process'* suggested by

Laurillard (2007, 160) which shows the notion of *'the world of experience'* for the role of teacher in the learning process; they present a further critical analysis of the conversational framework: *'Learning is viewed as a series of iterative conversations with the external world and its artefacts, with oneself, with other learners and, of course, teachers'.* Frohberg et al. (2009) have categorized mobile learning projects (published up to 2007) from a fully teacher-controlled learning scenario to a fully learner-controlled learning scenario and recommend scaffolding as an optimized option in the middle of the two extremes; their reasons for scaffolding recommendations include:

1. Learners are from a variety of backgrounds and have distinct learning needs.

2. Different phases of the learning process may vary in terms of need for scaffolding.

3. Scaffolding may be very appropriate for individual learning and team-based learning.

4. Learners may encounter unexpected problems or opportunities and may need to take the initiative when making decisions by themselves at times.

In mobile learning environments, it is crucial to decide how autonomous a learner should be so that the best learning outcomes can be achieved, Therefore, it is important to consider the necessary level of control when designing mobile learning environments.

2.6.5 Connectivity

Connectivity, in respect of mobile technologies, refers to how mobile devices can have wireless connectionusing a variety of cellular and wireless access technologies such as GPS, EDGE, GPRS, GSM, 3Gs, 4Gs, WiMAX, WiFI, WLAN (Ambient-Insight's 2008; Greer 2013; Roschelle 2003). Mobile connectivity includes voice telephony and internet access for data transmission. Connectivity, as a mobile learning characteristic, relates to how effectively a learner can access the required information or learning material on a mobile device (Koole 2009).

Network access technologies work as an interface between users, mobile devices and learning resources. Learning resources may be accessible through a wide range of mobile technologies and devices. In the mobile learning arena, a few researchers have used the term 'accessibility' for network access capabilities and access technologies; however, accessibility is generally referred to in relation to the provision of proper facilities for people with disabilities (Rainger 2005). Connectivity enables mobile learning to be more ubiquitous and portable (Traxler 2005). As the network coverage continues to expand and develop better quality, more learners are likely to be attracted to mobile learning. Traxler (2005) also differentiates mobile learning from e-learning on the basis of connectivity and presence as he posits that mobile learning provides more opportunities for the learners to discover the knowledge-world in unique ways, which makes it distinct from e-learning and other forms of technology-mediated learning.

2.6.6 Mobility

Mobility is sometimes used as an interchangeable term with flexibility and portability (Koole 2009). It is the ease of accessing learning material and collaborating with peers regardless of time and space (Kukulska-Hulme and Traxler 2005). Mobility is one of the key constructs in the design of mobile learning systems and environments because mobility is, as noted by Sharples (2002), a shared attribute of mobile devices and the conceptions of learning; students learn in different places and different times when mobile devices support them to learn anywhere-anytime (Pachler et al. 2012). Naismith et al. (2004b, 4) define mobility as:

'The ability to link to activities in the outside world also provides students with the capability to 'escape' the classroom and engage in activities that do not correspond with either the teacher's agenda or the curriculum'

Koole (2009) has used the term 'portability', meaning 'mobility', which means that mobile devices can be taken to different locations and environments and even to remote or far-flung places. Subject to mobility characteristics, mobile learning is called spontaneous, contextual, on-demand, flexible, just-in-time, situated, portable and mobile (Traxler, 2009). Brown (Brown 2009) points out that mobility is becoming a way of life as it has made most mobile users keen to access resources

and turned them into implicit learners. Further, Brown (2009) recommends that the mobility of the devices should be exploited to enrich the learning experience of learners.

2.6.7 Blending

Blended learning is a ubiquitous learning solution which combines the benefits of various learning domains such as mobile learning, e-learning, face-to-face learning and contextual learning (Chao and Chen 2009; Peters 2009). Ally (2009) defines blended learning as a variety of learning approaches with virtual and physical learning resources combined appropriately. Accessing learning content via mobile devices is an advancement in the blended learning arena as it makes the learning experience life-long and informal (Pieri and Diamantini 2009). Wan and Wan and Howard (2007, 187) mention that the ubiquity of mobile devices enables blended learning in terms of resources available on mobile devices and a number of learning activities that a learner can perform such as:

'Concept-mapping, organization, note-taking, writing, researching, reading e-documents, doing worksheets and submitting them for checking, watching animations and movies, drawing graphs, calculating mathematical problems, data collecting, doing their homework, keeping a reflective log, undertaking recording (voice and stylus) and interacting with simulations and multimedia educational materials. Having access to a hand-held device all the time is like having all-in-one access to the pens, text books or other written resources, cameras, calculators, voice recorders, clocks and Internet'.

Naismith et al. (2004b) also consider that adapting the blended approach to mobile learning is imperative because of its orientation with multiple theoretical and practical perspectives. Literature shows that mobile learning, when blended with other forms of learning, makes the learning experience more fruitful, rigorous and collaborative (Fuchs 2012; Hooft 2013; Wang et al. 2009). Mobile learning provides an opportunity to support and enhance the performance of learners and engage them in learning activities. To include mobile learning in mainstream education, blending it with existing learning forms such as face-to-face learning and e-learning, is the rational solution for education providers.

2.6.8 Content

Mobile learning content refers to the learning resources for students in a format compatible with mobile devices (Frohberg et al., 2009). Low (2007) has formulated a set of mobile learning standards in the Australian Flexible Learning Framework for creating, adapting, accessing and modifying learning content or learning material for mobile devices. Mobile learning content development depends on the kinds of learning activities that are required for a specific learning scenario. The literature suggests a range of mobile learning activities such as accessing information remotely, file sharing, taking photos, recording and playing audio and video files and sharing these files remotely and creating collaborative content online (Parsons and Ryu 2009; Naismith et al. 2004b). Traxler (2005, 264) in his definition of mobile learning, calls it *'spontaneous, informal, bite-sized, light-weight, context aware, connected, personalized, interactive'* these terms indicate the type of content suitable for mobile learning. Mobile learning content can be custom-built by education providers following individual institutional preferences; however, packaged content (usually called mobile learning applications or apps, as activities, are translated to apps by software developers) is also available in the market (Ambient-Insight's 2008; Greer 2013; Parsons, Hokyoung, and Cranshaw 2006).

2.6.9 IT or Technical Support

Making mobile learning a seamless learning opportunity is not possible without providing technical support for teachers and students. Chen et al. (2010) suggest that the lack of appropriate technical and administrative support is one of the biggest factors influencing teachers' adoption of mobile learning. In particular, if teachers are digital immigrants and have to re design courses for mobile learning, they would need quite a lot of support. In addition to instructional design support, they would also require technical support if they face any problems with uploading and maintaining mobile learning content (Chen et al. 2010; Prensky 2009). Similarly, if students are faced with difficulties in accessing and downloading learning resources, immediate technical support would be required. Literature shows that mobile learning implementation at different educational levels such as schools, colleges and

universities requires extensive IT or technical support in order to make the mobile learning implementation successful and reliable (Ford and Leinonen 2009).

2.6.10 Cost

Mobile learning design and implementation produce heavy costs for institutions, and learners may also need to pay for the use of mobile data. Dyson et al. (2009) point out that the cost of mobile learning adoption is a considerable hindrance for many education providers. The cost of mobile technologies for learning has been divided into four main categories by Dyson et al. (2009). These are: 1) costs incurred by the education providers and the students in various areas including usage charges, 2) mobile hardware costs, 3) mobile software costs, and 4) costs of networks utilized by education providers.

Usage charges refer to the telecom providers' bills for the data usage; these charges are invoiced to the learners directly and most of the education providers are not willing to approve any grants to cover the usage charges. These charges are quite high and expensive for students even in many developed countries (Scornavacca, Huff, and Marshall 2009). Dyson et al. (2009) suggest that students could avoid extensive data charges by downloading learning material on a PC and transferring it to a mobile device and they would most likely prefer to use WI-Fi networks provided by institutions free of cost; however, avoiding costs for data usage may prevent them from using a number of opportunities provided by mobile learning on the move and outside the institutional premises.

The cost of purchasing a mobile device for learning is also quite high, but education providers often receive funding to purchase mobile devices for research purposes. Interestingly, in a study conducted in a European country, Economides and Grousopoulou (2009) found that students are willing to purchase even an expensive mobile device with advanced features. Similarly, Lundin et al. (2010) propose that education providers should exploit the students' personal devices for educational uses as they bring them to institutions and already use them for communication and social networking. As argued earlier in this chapter, universities could establish BYOD policies to allow students to integrate their own devices with LMS, thereby saving a significant amount of financial and other resources.

Table 2: Summary of Mobile Learning Characteristics

Model/Framework	**Mobile Learning Characteristics**	**Authors**
Pedagogical Framework of Mobile Learning	Collaboration	(Ozdamli 2012)
A scalable framework to quantitatively evaluate success factors of mobile learning systems	Usability, Mobility	(Issa, Al–Bahadili, and Abuhamdeh 2011)
Mobile Learning Framework for Lifelong Learning	Mobility, Usability, Collaboration	(Nordin, Embi, and Yunus 2010)
The Framework for the Rational Analysis of Mobile Education(FRAME)	Usability, Mobility	(Koole 2009)
The Framework for designing m-learning environments	Collaboration, Mobility	(Danaher, Gururajan, and Baig 2009)
The Framework for designing mobile learning spaces	Mobility, Context, Usability	(Parsons and Ryu 2009)
The Framework for collaboration in context	Collaboration, Context	(Spikol, K., and M. 2009)
Framework to integrate m-learning into e-learning	Mobility, Collaboration, Content	(Wains and Mahmood 2008)
An Interactive M-Learning model	Usability, Collaboration	(Wei, Zhuo, and Zhang 2008)
Framework for analysing mobile learning	Context, Collaboration	(Wali, Winters, and Oliver 2008)
A framework for enabling on-demand personalized mobile learning	Content, Communication	(Meawad and Stubbs 2008)
A framework for designing mobile learning	Usability, Context	(Uden 2007)
Conceptual framework for mobile CSCL	Collaboration	(Zurita and Nussbaum 2007)
Australian Flexible Learning Framework	Mobility	(Low 2007)
The conceptual framework for m-learning design requirements	Mobility, Usability Collaboration,	(Barbosa et al. 2007)
Task model for mobile learning	Control, Context, Communication	(Sharples, Taylor & Vavoula 2007b)
Mobile Learning Framework	Collaboration	(Motiwalla 2007)
A proposed theoretical model for m-learning adoption in developing countries	Mobility, Collaboration	(Barker, Krull, and Mallinson 2005)
Low-Key m-learning: a realistic introduction of m-learning to developing countries	Context, Collaboration	(Masters 2005)

A summary of mobile learning characteristics identified by mobile learning studies, including the mobile learning models and frameworks discussed in Section 5, have been included in Table 2. It is evident that mobile learning researchers have considered a number of mobile learning characteristics in these studies. However, very few researchers have focused on more than a few particular characteristics in a single study. Therefore, it is noteworthy that although most of these frameworks and models have addressed a number of mobile learning characteristics, none of these studies includes a comprehensive list of mobile learning characteristics; therefore, there is a major gap in the current mobile learning research literature.

2.7 Mobile Learning in Developed Countries

Mobile learning studies involving mobile learning projects and trial implementations have been conducted in many universities in developed countries such as USA, UK, Europe and Australia. The majority of these projects have been pilot-tested in various educational settings such as classroom response systems, intelligent tutoring systems, collaborative learning systems and contextual learning systems (field trips) (Frohberg, Göth, and Schwabe 2009).

Researchers have implemented mobile learning pilots at different levels in universities, colleges and schools. Various disciplines, such as medical, nursing, business, IT, language learning and employee training, have been included. However, a few universities in USA such as Duke University and Georgia State University have already introduced mobile learning in some mainstream education. Furthermore, major educational publishers including McGraw-Hill, Oxford University Press, Encyclopaedia Britannica and Harvard Business School Publishing have launched mobile contents for students (Ambient-Insight's 2008).

Unlike the research on mobile learning in developed countries, only a few research projects have been undertaken in developing countries. Developed countries spend enormous sums on research to explore and test the integration of innovative technology in learning environments (Mifsud 2002a). On the other hand, researchers

in developing countries have limited access to research grants for the purpose of conducting mobile learning trials. However, there are a few mobile learning research projects such as MobilED that have been made possible by financial grants from Nokia, UNESCO and several other sponsors (Ford and Leinonen 2009; Steve 2012; UNESCO 2005). The next section contains a detailed argument for mobile learning research in developing countries.

2.8 Mobile Learning in Developing Countries

Current literature indicates that most of the mobile learning theories and implementation trials have been carried out in the developed world. However, developing countries are in need of mobile learning research as the growth in the number of mobile users and mobile technologies is significant, but to implement mobile learning effectively, these countries need to upgrade their educational ICTs in order to progress (Barker, Krull, and Mallinson 2005). Traxler and Kukulska-Hulme (2005) identify a number of problems that limit the adoption of mobile learning in developing countries such as the lack of an uninterrupted power supply and poor ICT facilities. To date, a number of mobile learning pilot projects have been tested in India, Kenya and South Africa. The results of these trials have been encouraging so far; learning environments -at elementary, secondary and higher education levels- in developing countries can utilize the potential of mobile learning for informal and mainstream education (Traxler 2009). Technology-based learning for developing countries- countries with low per capita income according the WorldBank's classification- is an ultimate solution to improve their educational standard. The introduction of technology in education may open new educational avenues, particularly for those people who do not have access to the traditional educational resources such as face-to-face learning and paper-based learning in the case of distance education (Gulati 2008; WorldBank 2011).

Educational ICTs are becoming fast, reliable, available in remote areas and affordable for everybody, particularly in underprivileged communities (Kim 2009). It is important to note that social circumstances and infrastructural conduciveness are not similar even in all of the developing countries. For instance, Gulati (2008), in her review of technology-enhanced learning in developing nations, points out that in

South Africa, distance education programs are being preferred over e-learning-based programs because of the cost of Internet connections in remote areas. On the other hand, distance education students in Pakistan found that it was more convenient for them to access learning resources online than it was to be taught through satellite TV. Further, Indonesia, India and Bangladesh are also managing to provide education to the people of rural and remote areas by providing them with ICT support and introducing online degrees and courses.

These successful implementations of e-learning in education provide a sound basis for the introduction of mobile learning in developing countries. For the people of developing countries, mobile learning may help to eliminate certain barriers such as cost and slow speed of dial-up internet connections. The introduction of mobile learning into developing nations may provide education to children in underprivileged communities. Mobile learning may be more cost effective and efficient with flexible learning solutions provided to students who need to manage both work and study, thus reaching more learners who are required to support their livelihood. Training could also be provided to teachers using their mobile devices at a time and location convenient for them (Adesope, Olubunmi, and McCracken 2007; Motlik 2008). Traxler (2009, 17) emphasises the emergent need for implementation of mobile learning in developing countries despite the limited ICT resources and relatively unstable infrastructure as compared to technologically advanced societies in the developed world:

> *'It is entirely possible that the emergence of mobile learning in developing countries will take the evolution of e-learning along a trajectory that is very different from that in developed countries, where it has been predicated on massive, static, and stable resources'*

A number of mobile learning pilot projects and studies have shown encouraging outcomes in developing countries. These results motivate further research and make a conceptual contribution to research into mobile learning for developing countries. Most of the mobile learning research is being carried out in the developed world as these countries spend far more of their national budget on research, development and experimentation with new technologies in the educational realm (Ambient-Insight's

2008; Mifsud 2002a). Conversely, few research projects have been carried out in developing countries in this context. The lack of a research budget for educational ICTs is one of the factors that impede the mobile learning conceptualizations and implementations in developing countries. However, the literature presented in Table 3 shows a number of implementations of mobile learning in developing countries including India, Kenya, Latin America, Africa, Indonesia and Pakistan.

Most of these implementations have been limited to the pilot projects and trials. Early efforts show positive research outcomes in several ways such as participants' motivation, added flexibility in learning environments and support in fieldwork. More importatnly, telecommunication and cellular networks were used for provision of learning resources to the underprivileged and indigenous communities and people in remote, hard-to-reach places.. In addition, another aspect is that projects have been tested by vast numbers of students including elementary, K-12 and higher education participants. In addition, a variety of stakeholders such as students, teachers, educational administrators and IT managers have participated in these projects (Barker, Krull, and Mallinson 2005). Mobile learning research has been conducted across multiple educational disciplines such as medicine, business education, computer science and game-based learning. Mobile learning is applicable to both distance education and traditional face-to-face learning; both of these modes have been included in the case studies of the developing world (Wains and Mahmood 2008).

Table 3: Studies of mobile learning in developing countries

Study	**Brief description**	**Significance**	**Research Outcomes**	**Characteristics considered**	**Research method**	**Sample**	**Target Audience**	**Country**
Barker, Krull, and Mallinson (2005)	Proposes a theoretical model for mobile learning adoption in developing countries.	Conceptual	Developed a model for the adoption of mobile learning in developing countries.	Portability, collaboration, motivation	Literature Review/Model development	N-A	Key stake-holders from education sectors	South Africa
Facer K. et al. (2004)	Groups are supposed to communicate with each other while acting as lions in African Savannah.	Practical	Developed and tested a mobile learning game for school aged children.	Engagement, mobile gaming, tool to support learning	Pilot project/ Action research	Ten children aged 11 and 12	Elementary level school children	Sub-Saharan Africa
(Fotouhi-Ghazvini et al. (2008)	Explores the potential use of mobile devices for learning in Iran.	Practical	Concluded that mobile learning is best suited to informal learning	Usability, Cost, mobile learning activities	Surveys	181 high school students	School students	Iran
Ford and Leinonen (2009)	Examines the use of mobile devices in educational environment in developing countries.	Practical	Developed a set of guidelines for mobile device usage in and out of school	Cost, cultural contexts, collaboration, flexibility	Action research (Series of pilot projects called MobilED)	Students from elementary and middle schools and college	Schools and colleges from public and private sectors	South Africa, India, Brazil, Finland

Table 3: Studies of mobile learning in developing countries (continued)

Study	**Brief description**	**Significance**	**Research Outcomes**	**Characteristics considered**	**Research method**	**Sample**	**Target Audience**	**Country**
Gregson and Jordaan (2009)	Explores the design and delivery of distance learning program to diverse range of students	Practical	Developed a model for design and delivery of distance learning and mobile learning	Communication, access, engagement, collaboration, usability, flexibility	Case Study, Pilot project	88 Postgraduate distance learning students from South African region	Distance learning universities	Botswana, Lesotho Malawi, Mauritius, Zambia Mozambique, Namibia, South Africa, Tanzania, Swaziland, Zimbabwe
Kim, Miranda, and Olaciregui (2008)	Examines the use of mobile learning technology to serve poor indigenous Latin American children.	Conceptual, Practical	Literature review of education inequality in Latin America; pilot project named 'pocket school' for indigenous children.	Mobile learning design considerations, cultural sensitivity, usability	Pilot project	Indigenous school-aged children	Elementary school level children	Latin America
Masters (2005)	'Low-key m-learning' investigates the foundations of transition to mobile learning from traditional learning environments.	Conceptual, Practical	Developed a model for the process of transition into mobile learning; a pilot project has been tested in a university environment.	Contextualized, cultural context, pedagogy, mobility, communication, cost, ubiquity of technology,	Pilot project, surveys	2nd and 3rd year medical students	Medical students at undergrad level	South Africa

Table 3: Studies of mobile learning in developing countries (continued)

Study	Brief description	Significance	Research Outcomes	Characteristics considered	Research method	Sample	Target Audience	Country
Oliver and Goerke (2008)	Examines university students' adoption of mobile devices for learning.	Practical	Observed students' use and adoption of mobile devices and web 2.0 applications	Convenience, connection, control, cultural contexts	Case studies, surveys	54 undergrad students	University students	Ethiopia, Malaysia
Sari and Tedjasaputra (2008)	Studies the potentials and challenges of mobile learning at school and university levels.	Practical	Identified potentials and challenges of mobile ICTs in education for Indonesia and Finland	Communication, collaboration, mobile learning activities, learning support	User-centered design, ethnographic action research	650 students and 100 teachers	Students and teachers at school and college levels	Indonesia Finland
Traxler and kukulska-hulme (2005)	Reviews the potential of mobile learning in developing countries.	Conceptual, practical	Mobile learning implementation strategies and challenges for developing countries identified.	Cost, usability, accessibility, content, connectivity	Case studies	A university and a software company	Population in developing countries	India
Wains and Mahmood (2008)	Investigates the integration of mobile learning into e-learning	Conceptual, practical	A framework proposed to integrate mobile learning into e-learning	Mobile technologies, flexibility, access, personalized	Case study	Two distance learning universities	Distance learning universities	Pakistan

To continue the discussion about the list of research papers as shown in Table 3, characteristics such as engagement, collaboration, communication and portability or flexibility have been considered by the participants of mobile learning studies in developing countries. Some researchers also investigated the cultural context of the country and its level of impact on the implementation of mobile learning in that particular country. The cost of the mobile internet and mobile devices was a matter of concern for the student population in spite of the fact that mobile internet services are significantly cheaper in the developing countries compared to developed countries.

Research participants in the developing countries, particularly from indigenous and underprivileged communities, were unfamiliar with educational ICTs; therefore, they had concerns about the practicality of mobile devices for learning (Oliver and Goerke 2008; Kim, Miranda, and Olaciregui 2008). Overall, most of the researchers found that learners in the developing countries were excited and motivated by the notion of using mobile devices for learning. In some countries, network connectivity was also a problem, especially in remote and rural areas. Participants in developing countries needed technical support in order to switch from traditional learning and e-learning modes to mobile learning. They also needed assistance and initial training by the researchers in order to undertake mobile learning activities.

2.9 Research Gaps in Existing Literature

Mobile learning models and frameworks discussed in Section 2.5 cannot be generalized and used for Pakistani university environments since there are certain gaps in the current conceptualizations of mobile learning which hinder their adaptation in developing countries like Pakistan in many ways. For instance, the findings from the literature show that most of the studies have focused on a particular set of mobile learning characteristics such as usability, collaboration, flexibility and connectivity while completely ignoring the other important characteristics. Some researchers focused only on one or two of the mobile learning characteristics; for example, Spikol et al. (2009) pointed out context and collaboration. Some of the

characteristics such as context, control, engagement and the blending of mobile learning with other forms of learning have been used by only a few of the mobile learning researchers, while other mobile learning characteristics such as user experience, motivation, technical support and cost have rarely been included in most of the mobile learning models and frameworks. That is one of the major gaps in the existing mobile learning research literature which this research aims to address.

Figure 8 gives a snapshot of the mobile learning characteristics discussed in the most-cited mobile learning studies in the literature and other important characteristics not mentioned in the literature. Some of the selected studies have been used in this snapshot to demonstrate how the existing studies have been examined, analyzed and compared for mobile learning characteristics. In Figure 8, the inner rectangles show the main mobile learning characteristics considered in that particular study; the outer rectangles contain the characteristics which have not been considered in that particular study.

Another gap in the current mobile learning research literature is that some of the existing mobile learning conceptualizations including certain models and frameworks have been proposed after a literature review but have not yet been evaluated using data evidence collected from any participants. Two examples are Koole's (2009) FRAME model and the mobile learning adoption model of Barker et al. (2005). Moreover, very few of these frameworks have higher education as their focus, leaving another significant gap in the mobile learning literature that needs research to be undertaken involving higher education stakeholders. It is important to mention the fact that many authors have worked on mobile learning research as it has been elaborated in this literature review chapter, the work are quite disparate and a comprehensive model and framework for mobile learning is missing. Many of the reserachers has focused on specific areas and did not consider the other possibilities to capitalise on the use of mobile learning technologies; that is a major gap in existing mobile research literature. There is a dire need for a mobile learning model/framework which this research aims to develop. UNESCO (REF UNESCO 2014) is also trying to bring scholars, reserachers, policy makers and learning scientists together to tackle this issue to define mobile learning, build theoretical stance for mobile learning, implementation feasibilities in different educational

scenarios as well as ways to evaluate mobile learning. Outcomes of this research as well as Mobile Learning Framework released at the end of this thesis would be an important contribution to the body of knowledge in mobile learning.

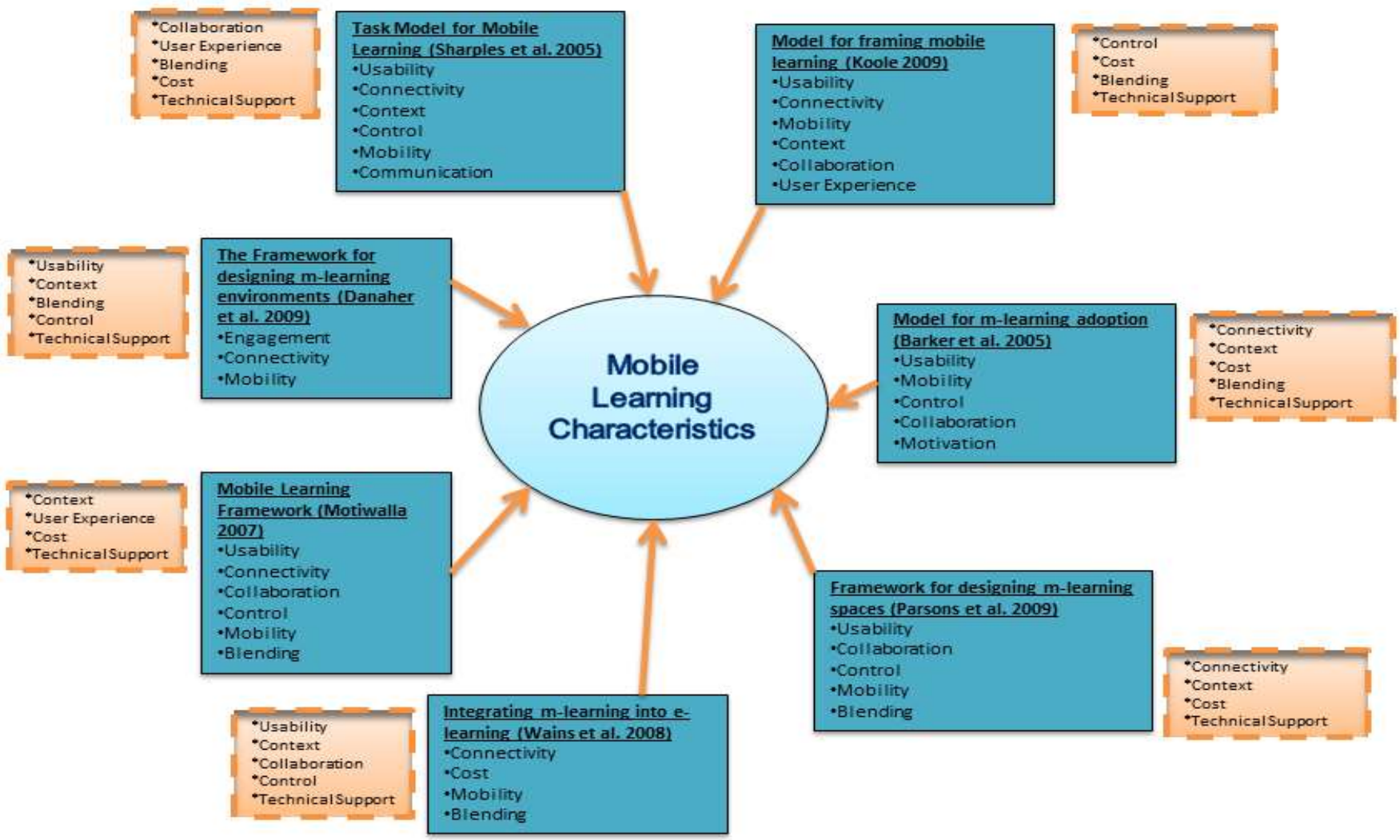


Figure 8: Research Gaps- a literature snapshot

This research takes into account existing mobile learning models and frameworks from the literature as discussed in this chapter, and develops a mobile learning conceptual model for Pakistani universities. An initial mobile learning conceptual model (see Figure 9 in section 2.10) for the Pakistani university environments will be used to inform the research design by identifying a set of common mobile learning characteristics for Pakistani universites. Furthermore, the gaps in current literature about definitional and pedagogical aspects of mobile learning will be considered in the Mobile Learning Framework as outcome of this research.

2.10 The Initial Mobile Learning Conceptual Model

The initial mobile learning conceptual model (See Figure 1) has been adapted from Danaher et al. (2009), Sharples et al. (2005), Barker et al. (2005) and Koole (2009). People, Interactivity and Technology have been identified by these researchers who have categorized mobile learning characteristics in mobile learning models and frameworks. People (students, teachers, administrators, educational managers, instructional designers and technical support staff) interact with technology to communicate and collaborate with each other by taking advantage of the flexibility offered by mobile technologies. In learning environments, technology plays a mediating role to improve understanding (Sharples, Taylor, and Vavoula 2005). Sheng et al. (2005, 270) define mobile technologies from the perspective of strategic use:

> *'by extending computing and the Internet into the wireless medium, mobile technology allows users to have anytime, anywhere access to information and applications, which provides greater flexibility in communication, collaboration, and information sharing'*

People, Interactivity and Technology (see Figure 9) have been grouped into the main categories according to mobile learning characteristics. Each leg of the model is important as detailed characteristics have been identified. Students, teachers, administrators, educational managers, instructional designers and IT/technical support staff are key stakeholders in mobile learning. These stakeholders are

beneficiaries of mobile learning and have a great impact on the successful design of mobile learning. Interactivity includes pedagogical aspect of mobile learning and includes interactions between people, devices and systems. It enables collaborative activities, especially in field work and assists learners to share information, be involved in social networking, participate in class discussion boards, download lecture slides, podcasts and vodcasts, get instant feedback from teachers, and receive alerts about assignment deadlines. Technology provides access to learning resources anywhere and at any time, and to user interface and applications (Ally 2009; Barker, Krull, and Mallinson 2005; Becta 2008; Clough et al. 2009; Ford and Leinonen 2009; Grosseck 2009; Spikol, K., and M. 2009; Oliver et al. 2009; Naismith et al. 2004a).

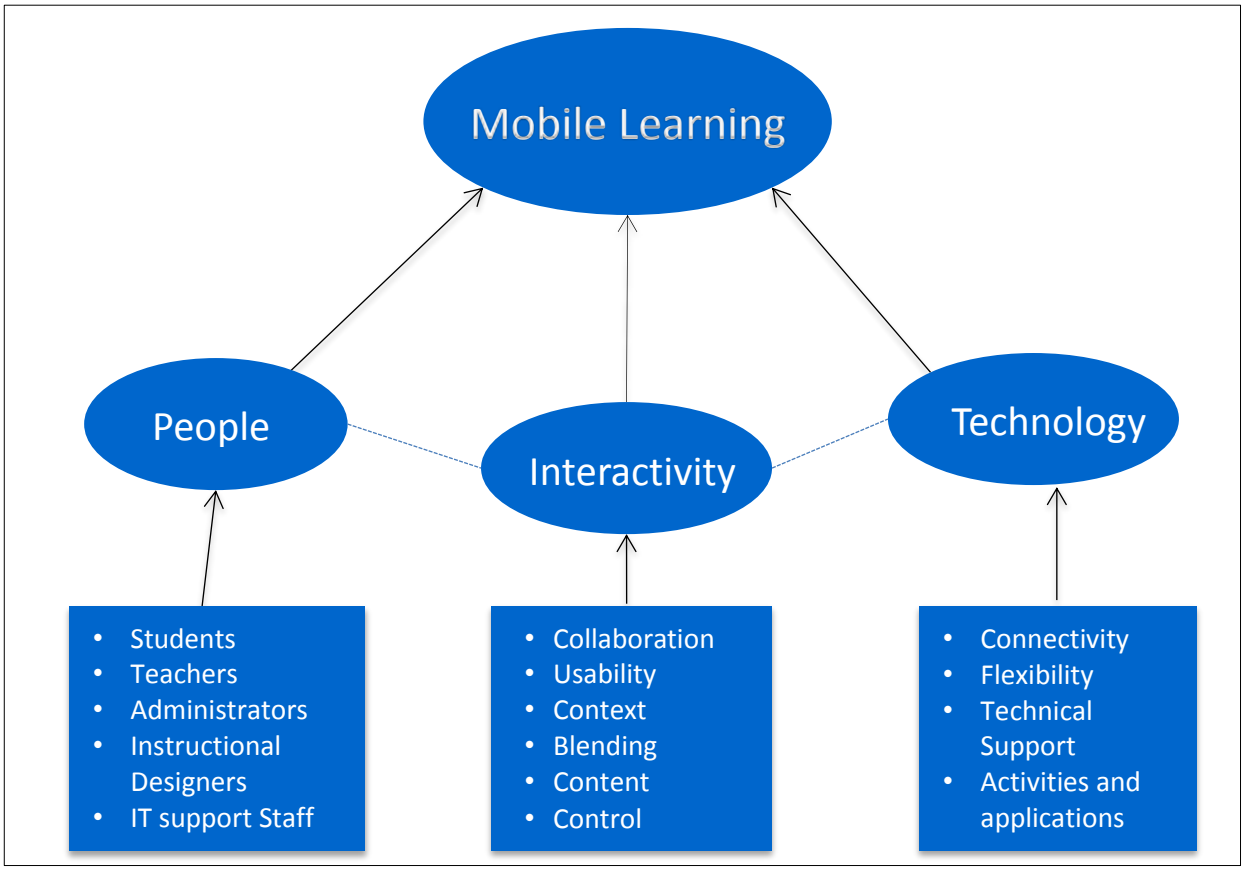


Figure 9: Mobile Learning Conceptual Model

(Adapted from Danaher et al. (2009), Sharples et al. (2005), Barker et al. (2005) and Koole (2009)

At a later stage of this research project, this conceptual model will be enriched by the data collected from the key stakeholders in Pakistani universities including students, teachers and educational administrators. A new mobile learning model will be formulated as an outcome of the findings of this research.

The proposed research will reshape the way ICT is used in Pakistani universities. The proposed mobile learning conceptual model for Pakistani universities will provide guidelines for instructional designers and teachers to design mobile learning activities that blend with existing learning forms. Students will engage in the learning process anywhere-anytime and they will be able to utilize their social and leisure time for learning activities. Moreover, the educational managers and IT managers will provide teachers and students with the required support Finally, educational administrators will be able to plan the on-campus resources by providing students with remote access. By introducing and promoting mobile learning, universities can attract more students as well as raise the level of education to international standards by endorsing up-to-date technology in education. For further research, the proposed mobile learning conceptual model will be enriched by data collected from Pakistani universities. Students and teachers will be invited to participate in focus groups and other key stakeholders will be interviewed. Also, this conceptual model can work as a blueprint for future researchers for mobile learning project implementation and testing in Pakistan and other developing countries.

2.11 Chapter Summary

In order to include mobile learning in mainstream education, mobile learning design needs to be informed by certain criteria. The criteria for mobile learning design should include mobile learning characteristics such as usability of mobile devices for learning, enhanced collaboration among peers and teachers, learning in multiple contexts, teachers' control over the learning process and independence of learners, costs involved in providing mobile learning for different stakeholders, and mobile learning content design which includes appropriate activities and applications in conjunction with the affordances of mobile devices.

Around the world, mobile learning researchers are investigating these characteristics in conceptualizations and implementations in order to establish criteria for mobile learning design. Mobile technologies certainly have a huge potential for use in academia. The field of mobile learning is still in its infancy with respect to having its own established theories and conceptualizations. Mobile learning researchers have borrowed established theories from other disciplines to inform mobile learning

research design. A number of researchers have created mobile learning frameworks and models which indicate that the process of theorization is progressing. This chapter has summarized mobile learning models and frameworks with the lens of mobile learning characteristics incorporated in those literature models. The mobile learning researchers have included a number of mobile learning characteristics such as usability, collaboration, context, and mobility in different research designs for different educational levels. These characteristics are important ingredients in theory formation for mobile learning. Based on the review of literature pertianing to mobile learning, an intial mobile learning conceptual model has been developed to inform this research design. The gaps in existing literature has been identified and the critique on the literature review has been presented. The need for a mobile learning framework has been identified.

CHAPTER 3 RESEARCH METHOD

3.1 Introduction

This chapter discusses the selection of an appropriate methodology for this research. The rationale for mobile learning research in the context of Information Systems has been explained. A number of dominant research paradigms in the field of Information Systems research have been discussed to determine the orientation of this research to the appropriate research paradigm. Discussion of the research objectives and research questions led to the selection of the research paradigm, research method and appropriate data collection approaches for this research. Research design considerations have been discussed in detail and the description of data collection procedures demonstrates the transparency of the research process. Data analysis process including data analysis tools and data analysis strategies has been elaborated with examples and screen shots from NVivo qualitative data analysis software. Finally, the ethical considerations are also presented followed by the chapter summary.

3.2 Mobile Learning Research as Information Systems Research

Mobile learning research is a multi-disciplinary research field and has its roots in a number of other disciplines such as Information Systems, Human-Computer Interaction, Telecommunication Engineering and Education (Vavoula, Pachler, and Kukulska-Hulme 2009). Early researchers in the field of mobile learning have built upon the theories, models and frameworks from these disciplines. This researcher's background is in the field of Information Systems which is also a multi-disciplinary field as indicated by Khazanchi et al. (2000). King (1993) also maintains that Information Systems is a field that has contributors from a variety of other

disciplines. Furthermore, Keen (1990) states that researchers from other fields have also carried out research in the domain of Information Systems.

Keen (1991, 27) believes that Information Systems research informs businesses, governments and societies about the practical implications of information technology and information systems:

> *'ISR can be and should be at the forefront of the intellectual debate and investigation about the application of information technology across every aspect of business, government and society and that it has many valuable, original and practical recommendations to offer concerning the effective design, development, implementation, use and impact of IT'*

This statement suggests that information systems research also draws the definition of Information Systems which may be strengthened by the definition of information systems by Avison and Fitzgerald (1997, xix): *'The effective design, delivery, use and impact of information technology in organizations and society'.*

The definition and description of Information Systems research by Keen (1990) has been used as the baseline for this research to study the potential effects and benefits of mobile devices as Information and Communication Technologies for members of particular teaching and learning communities such as higher education sectors or universities. In addition to the conceptualization of mobile learning for Pakistani university environments, this research concludes with practical recommendations and implications for the relevant stakeholders within that community which may ultimately assist them to design and implement mobile learning in university environments. As mobile learning has similar connotation as those of Information Systems, the research method and design of this study are discussed within the context of the field of Information Systems. The next section provides a detailed review of Information Systems Research Paradigms followed by the paradigm chosen for this research.

3.3 Information Systems Research Paradigms

In the field of Information Systems (IS), there are three major paradigms: 1) Positivist 2) Interpretivist and 3) Critical (Galliers 1991; Hirschheim 1985). The following subsections provide a brief description of each of these IS paradigms.

3.3.1 Positivist Research

Positivists believe that reality is objective and can be studied through numbers by the researcher who is independent of the phenomena being studied (Chen and Hirschheim 2004; Orlikowski and Baroudi 1991). Klein and Myers (1999, 69) state that IS research is positivist if:

> *'there is evidence of formal propositions, quantifiable measures of variability, hypothesis testing, and the drawing of inferences about a phenomenon from a representative sample to a stated population'*

IS researchers working with quantitative data, testing a well-formed theory, generating hypotheses, working with dependent and independent variables and being independent of the research context, generally consider themselves to be positivists.

3.3.2 Interpretive Research

Walsham (1995) considers interpretivism as the opposite of positivism as it does not rely on objective data. Interpretivists believe in subjective reality and the study of research phenomena in their natural settings (Oates 2006). Orlikowski and Baroudi (1991) maintain that:

> *'Interpretive studies assume that people create and associate their own subjective and inter-subjective meanings as they interact with the world around them. Interpretive researchers thus attempt to understand phenomena through accessing the meanings that participants assign to them'*

The views of Chen and Hierchheim (2004) and Myers and Klein (1999) regarding interpretivists' beliefs are included in Table 4.

Table 4: Summary of Information Systems Research Paradigms and Associated Beliefs: Adapted from (Chen and Hirschheim 2004; Klein and Myers 1999; Orlikowski and Baroudi 1991)

IS Research Paradigms	**Ontological Beliefs**	**Epistemological Beliefs**	**Methodological Beliefs**
Positivist Research	• Reality or phenomenon being studied is objective and quantifiable • The researcher is independent of the phenomena being studied	• Making hypotheses • Testing theories • Accepting or rejecting theories • Generalizing results	• Working with statistical data • Use of quantitative methods • Working with independent and dependent variables
Interpretive Research	• Reality exists subjectively • The phenomena being studied needs human involvement; the researcher cannot be secluded from the context of the research	• Knowledge is gained through understanding the phenomenon in natural settings (cultural and contextual) • Multiple interpretations and insights from the data collected	• Researcher's interaction with the participants • Understanding of the phenomena from participants' viewpoints • Working with qualitative data mostly; however quantitative data may also be used in some cases • No predefined variables; themes have emerged from the data
Critical Research	• The reality is built historically • The reality is shaped by the people • Humans and organizations do change over the time and strive to change their social conditions	• Knowledge is gained by understanding society and the history of that society • Knowledge of social-cultural conditions of the people are also required as it indirectly shapes the way they perceive and believe about reality	• Critique of the contradictory social practices • Tend to be longitudinal and ethnographic studies • Both qualitative and quantitative data are used

3.3.3 Critical Research

The critical paradigm consists of studies presenting critiques of social injustice and how this shapes the beliefs and norms of society. Orlikowski and Baroudi (1991, 5) define the critical paradigm as:

> *'Critical studies aim to critique the status quo, through the exposure of what is believed to be deep-seated, structural contradictions within social systems and thereby to transform these alienating and restrictive social conditions'*

The ontological, epistemological and methodological perspectives of the critical paradigm are summarised in Table 4.

3.3.4 Research Paradigm choice for this research

The criteria for different research paradigms presented in Table 4 provide a basic understanding of the building blocks of a research paradigm; however, the paradigmatic choice for a particular research needs to be carefully selected by the researcher. In addition, the choice of research method and particular design makes it more complex. After understanding the historical evolution of IS research paradigms, this research topic was evaluated under each paradigmatic lens. *Ontologically*, this research needs the researcher's involvement and interaction with participants; therefore, this research tends to focus on interpretivism as this particular phenomenon is neither objective nor developed historically. *Epistemologically*, the phenomenon is being researched in natural settings; this involves the understandng and knowledge of the interpretive paradigm. However, catching the context of socio-cultural environment takes the epistemology of the critical paradigm. Similarly, the absence of hypotheses rules out the choice of a positivist paradigm, the possibility of analytical generalization of results to a larger community such as all universities in Pakistan or other developing countries tends towards positivism (Yin 2009). *Methodologically*, this research does not pre-establish independent and dependent variables, since themes emerge as the data is collected by the researcher's interaction with the participants. This research does not present a critique of social practices; however, the participants' socio-cultural backgrounds have been discussed

to give the reader a clearer understanding of the phenomenon being studied. After considering the phenomenon being studied in terms of epistemology, ontology and methodology, the characteristics of this research approach place it within the realm of the interpretive paradigm (Chen and Hirschheim 2004).

3.4 Information Systems Research Methods and Designs

The literature shows that a variety of terms have been used to describe research methods in the field of Information Systems. For instance, terms such as research approach, research method, research methodology, research strategy, and research technique have been frequently used in discussions of research methods (Chen and Hirschheim 2004; Galliers 1991; Oates 2006). Research design, however, is a detailed plan that is followed by the researcher when conducting a study. Yin (2009, 26) defines the research design as:

> *'The logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusions'*

Most of the literature including (Chen and Hirschheim 2004; Klein and Myers 1999) on Information Systems research methods divides IS research methods into qualitative and quantitative research methods and compares the characteristics of the two. Galliers (1991) presented a comprehensive review of around ten possible research methods in the field of Information Systems; these research methods include theorem proof, laboratory experiment, field experiment, case study, survey, forecasting and future research, simulation, game playing, subjective, descriptive, and action research.

Chen and Hirschheim (2004) identified six popular research designs in IS research following the criteria established by Orlikowski and Baroudi (1991) who considered both IS research methodology and IS research paradigms. These research designs include survey studies, case studies, lab experiments, field experiments and action research. Myers (2009) has also included ethnography and grounded theory. Surveys and lab experiments tend to be in the realm of quantitative research methods

and designs; case studies, ethnographies and grounded theories are categorized as qualitative studies. Yin (2009) argues that the triangulation of research techniques is important for some research designs and provides a rationale for using a survey method when designing a case study and including a case study within a large survey research design.

3.4.1 Research Method and Design Choice for this Research

A researcher needs to consider a number of approaches before choosing the one most appropriate for the research purpose(s), including: paradigms, research method and design, qualitative or quantitative approaches for data collection, or triangulation of both. Being a positivist researcher does not mean that one relies solely only quantitative methods; quantitative, qualitative or a triangulation of both methods can be applied; the same is true for an interpretive researcher (Dubé 2003). There is no set rule that dictates how the researcher should design the research. In this instance, the review of mobile learning literature revealed that the researchers in the field of mobile learning have used similar historical perspectives of existing paradigms, methods, designs and data collection techniques as those practised by IS researchers (Galliers 1991; Vavoula 2009; Yin 2009). As the chosen paradigm for this research was interpretivism, there were a number of possible research approaches for its design. Considering the variety of research methods and design approaches available in Information Systems research literature as discussed in the earlier sections of this chapter, it was important to compare the various approaches prior to choosing the most appropriate method and design for this research. To this end, a number of possible research methods and designs were considered including surveys, ethnographies, action research and case studies. The following section justifies the choice of research approach for this research, and explains the reasons for accepting an approach and rejecting others.

Surveys are conducted for the larger population sample usually testing a well-established theory, and results of the survey research are generalizable to a mass audience (Chen and Hirschheim 2004; Klein and Myers 1999). The survey research method was not appropriate for this research because the theory is in early stages in the field of mobile learning. This research intends to explore the viewpoints of

stakeholders of university learning environments in Pakistan to determine the likelihood of future implementation of mobile learning. Once the basic feasibility has been assessed, a survey may be an appropriate approach in future extensions of this research.

Ethnography is a popular research technique in the interpretive paradigm to study people's cultural interpretations of a certain research problem (Goulding 2005; Oates 2006). Understanding of the cultural backgrounds and interpretations of the different stakeholders may contribute to this research; however, ethnography was not an ideal approach for this research as it takes a long time and this research was limited by the time constraints of the PhD program. Furthermore, ethnographers do not interact with the participants, whereas this research involves a considerable amount of interaction between the researcher and the participants in order to elicit answers to the research questions (Mahmood 2005).

Action research could be an ideal choice for this research as the action researcher introduces a change to the phenomenon and studies the effects of the intervention (Baskervillea and Pries-Hejeb 1999; Miles and Huberman 1994). As discussed in Table 3 from Chapter 2, a number of researchers have successfully completed similar research projects when introducing mobile learning in schools or universities around the world (Ford and Leinonen 2009; Kukulska-Hulme and Traxler 2005; Pachler, Bachmair, and Cook 2010). However, only a few of mobile learning researcher have used action research as a method. This research could begin as an action research by conducting a mobile learning pilot project involving a course, an instructor and a number of students in one of the universities. However, the action research approach was rejected for two reasons: 1) it was important to conduct a study to assess the feasibility of future implementation of mobile learning in mainstream eduction in Pakistani universities by investigating opinions of key stakeholders in university environments such as students and teachers. This research is a ground breaking study of mobile learning in Pakistani universities as no previous study has been conducted by any researcher to determine the feasibility of implementing mobile learning in university education in developing countries specifically in Pakistani universities 2) an action research project would have needed a number of resources including a large budget, human resources, official approval of the project and funding from the

university and the Higher Education Commission of Pakistan which involves lengthy paperwork and time delays (Mifsud 2002b). Apart from the time constraint, there were limitations regarding access to the resources required for the action research, such as approval from the Higher Education Commission of Pakistan.

The case study approach was another ideal candidate for this research and was carefully considered. Case studies provide researchers with the opportunity to understand the phenomenon in detail by interacting with the participants so that the interpretation of data is more meaningful and a reflection of the reality (Kaplan and Duchon 1988; Yin 2009). The case study approach is ideal for a research problem when the theory is in the early stages of construction; when several researchers have looked into that research problem previously; and when the research problems are new or innovative (Benbasat, Goldstein, and Mead 1987). For all of these reasons, the case study approach is an appropriate choice for this research.

3.5 Overview of Case Study Research Method in Information Systems

Cavaye (1996) believes that the IS case study research conducted with an interpretivist lens assists the researcher to understand a certain phenomenon; whereas the positivist case study approach is intended to determine the values for certain variables and observe the behavior of those variables. Case study research or the case research method has been a popular approach in Information Systems research (Eisenhardt 1989). IS case study research can be conducted as positivist, interpretivist or critical research (Myers 2009). However, the research techniques for the data collection have been qualitative in most of the case research designs, therefore, the case study research approach is usually considered to be qualitative (Benbasat, Goldstein, and Mead 1987; Eisenhardt 1989). Yin (2009) argues that case study research should not be considered as being solely qualitative research because the triangulation of qualitative and quantitative techniques has also yielded more meaningful results in many IS case research studies (Dubé 2003). However, the sole use of quantitative data collection methods in case research design is rare because quantitative methods such as surveys are not meant to capture the context of the

phenomenon being studied (Yin 2009). In case studies, the context is embedded in the phenomenon in such a way that it cannot be studied without the involvement of the researcher. Capturing the context of the phenomenon is the most important building block of case study research as explained by Yin (2009, 18):

> *'A case study is an empirical inquiry that*
>
> *Investigates a contemporary phenomenon in depth and within its real-life context, especially when*
>
> *The boundaries between phenomenon and context are not clearly evident'*

Benbasat et al. (1987, 370) define that:

> *'A case study examines a phenomenon in its natural settings, employing multiple methods of data collection to gather information from one or a few entities (people, groups or organizations)'*

Case studies can be conducted in a variety of different ways, implying that case research has many design variations. According to Yin (2009) and Benbasat et al. (1987), a case study can be:

- Explanatory: an investigator tries to explain why and how a certain situation has emerged
- Descriptive: the researcher describes in detail how things occur
- Exploratory: the researcher explores how and why things happen where there is less prior knowledge about the situation

Also, case studies can be designed and conducted as single case studies to describe, explain or explore a research problem; and a multiple case study research design may be chosen when a cross-case synthesis is needed along with individual cases to extract rich, detailed and multi-faceted interpretations and findings (Benbasat, Goldstein, and Mead 1987; Eisenhardt 1989; Yin 2009).

3.6 Research Design

Benbasat et al. (1987, 370) claim that case research design is ideal for three possible scenarios in information systems research: *'1) studying information systems in natural settings; 2) answering 'how' and 'why' questions; 3) few previous studies have been conducted in the particular area of research.'*

Benbasat et al. (1987) argues that the field of IS may be the subject of numerous new areas of research every year, so case research design would be appropriate for a detailed inquiry into the phenomenon. For this research, the arguments of Benbasat et al. (1987) are applicable as mobile learning is a relatively new area of research that emerged just a decade ago in developed countries and is still emerging in the developing world; quite a few studies have already been conducted in this area in developing countries (Traxler and Kukulska-Hulme 2005). This research is intended to explore the characteristics of mobile learning in Pakistani university environments; therefore, this phenomenon cannot be studied if the researcher is outside of the research settings. Also, the researcher is seeking answers to the research questions, focusing on 'how' and 'why' in order to examine the matter in depth. For this research, an exploratory case study design has been chosen given the nature of the research problem and the phenomenon being studied.

Mobile learning is an area which has not received much attention from researchers in Pakistan; therefore, it is important to explore the feasibility of implementing mobile learning in Pakistani universities by discovering the important characteristics of mobile learning in Pakistani university environments. Since this research will be conducted according to an exploratory multiple case research design, the following will be its major components. In developing this design, the insights derived from Yin (2009), Chen and Hirschheim (2004), Benbasat et al. (1987), Cavaye (1996) and Dube (2003) were used.

1. Research Objectives and Questions

2. Units of Analysis

3. Data Collection

4. Data Analysis

3.6.1 Research Objectives and Questions

Every study has a purpose and, particularly for exploratory case studies, the researcher has to define the purpose of the investigation from the outset (Yin 2009). For this study, the ultimate objective is to examine the extent to which the university environments in Pakistan are ready to embrace the technological innovation such as the use of mobile devices for learning, and incorporate these into traditional learning practices. Hence, the characteristics of mobile learning need to be identified within the context of Pakistani universities, and the development of a conceptual mobile learning model for universities in Pakistan will be one of the outcomes of this research. The model may assist administrators and teachers to use mobile learning characteristics in universities in Pakistan. In addition, the model may provide the conceptual foundation for future research on mobile learning in Pakistani universities and other higher education institutions. In this regard, the major objectives of the research are to:

1. Identify the characteristics of mobile learning in Pakistani university environments.

2. Investigate the perceptions and expectations of university administrators, students and teachers regarding mobile learning characteristics in Pakistani universities.

3. Develop a conceptual mobile learning model for Pakistani universities.

To fulfil the research objectives, the case study researcher must first and foremost identify and articulate appropriate research questions for the case study research. In addition, the nature of the research questions assists the researcher to determine the appropriate research method. hence, the following research questions have been framed for this research to achieve the research objectives:

RQ1: What do the students perceive and expect of mobile learning in Pakistani universities?

RQ2: What do the teachers perceive and expect of mobile learning in Pakistani universities?

RQ3: What do university administrations perceive and expect of mobile learning in Pakistan?

RQ4: What are the common mobile learning characteristics to consider when designing a mobile learning environment for Pakistani universities?

3.6.2 Units of Analysis

It is important to identify units of analysis for the case study during the design phase. Depending on the research question posed, the units of analysis may be individuals, groups or organizations (Yin 2009). According to Yin (2009), it is also quite common that in a case study research design, groups of people or individuals are the units of analysis. For this research, the analysis focuses on what matters to groups of people, not to a particular individual. Therefore, the main units of analysis would be groups of Students, Teachers, IT Managers, Instructional Designers and Administrators. It is important to note that although IT Managers, Instructional Designers and Administrators from three universities have been interviewed individually rather than as a group, their opinions have been analyzed and discussed collectively in the discussion and findings chapters.

3.6.3 Data Collection

Benbasat et al. (1987) consider case study research to be qualitative research. Case studies, however, can be designed in many different ways depending on the research questions. Therefore, case study design may include qualitative data collection techniques such as interviews and documents, and quantitative data collection techniques such as surveys; they may follow a design where triangulation of qualitative and quantitative research techniques is required in order to yield richer findings (Yin 2009). Yin (2009, 115) recommends the inclusion of multiple data sources so that case study findings are more rigorous:

> *'The use of multiple sources of evidence in case studies allows an investigator to address a broader range of historical and behavioural issues. However, the most important advantage presented by using multiple sources of evidence is the development of converging lines of inquiry, a process of triangulation and corroboration'*

For this research, a qualitative research approach has been chosen; however, multiple sources of data have been included in the research design such as focus group discussions, individual interviews, documents and direct observation. The following sub-sections present the details of the selected data collection techniques for the research design, data types, data sources and data processing along with the rationale for case study selection, the participant recruiting process, and field procedures during the actual data collection on case study sites.

3.6.3.1 Case Studies - Rationale for the Selected Universities

Three universities have been selected for this study based on the ranking data of the Pakistani universities available on the Higher Education Commission Pakistan's website available in 2009 (HEC 2009). The students, teachers and administrative stakeholders from the three universities were the target population for this study. In order to have a balanced representation of a variety of socio-cultural backgrounds of the students and teachers (the main participants in the study and therefore the immediate beneficiaries) the universities were selected from both the public and the private sectors (HEC 2009). Two universities have been selected from the public sector (named University A and University B for the purposes of this research) and one university represents the private sector (University C) so that people from different social and financial backgrounds are represented in the population sample representation. Sample size includes three focus groups from students, three focus groups from teachers (average 7 participants in each focus group) and nine individual interviews from the leadership stakeholders in three universities. This sample size is relatively smaller than that of qualitative studies, however, appropriate for qualitative studies as argued by Crouch, Mira, and Heather McKenzie (2006).

3.6.3.2 Instrument Preparation and Validation

Similar to every research design, case study design also has several parameters to judge the quality of the case study research and reliability of the findings and conclusions (Straub and Carlson 1989; Yin 2009). A researcher can perform a few tests to ensure the quality of the research process such as construct validity, content validity, internal validity (not applicable for exploratory case studies because it measures the cause and effect relationship, therefore, it will not be discussed in this research), external validity and reliability (Yin 2009).

The preparation of the questionnaires and discussion guides for the focus groups and individual interviews was an iterative process. The questionnaires were developed carefully after reviewing the literature. The questionnaires were reviewed by a panel of experts and following multiple iterations, the final questionnaires and discussion guides were submitted for ethics approval.

3.6.3.3 Construct Validity

Construct validity ensures that the instruments used for data collection are appropriate for the purpose of the study, the type of data being collected, and to answer the research questions (Yin 2009). Yin (2009) considers it a challenging task to ensure construct validity in case study research, in particular where the case studies design includes qualitative data collection approaches. This implies that care must be taken to confirm the construct validity and this is completed by using multiple sources of data. For this research, the construct validity has been assured by multiple means such as use of focus groups and interviews in the studies of mobile learning from published literature. The use of multiple sources of data as well as the replication of focus groups and interviews using the same construct ensures the validity of the construct.

3.6.3.4 Content Validity

Content is validated if the items included in the instruments successfully measure all aspects of the construct (Straub and Carlson 1989). It is important to ensure content validity so that the gathered data addresses the research questions. For this research,

the content has been created based on the themes included in the conceptual model, which includes the underpinnings of mobile learning from the literature. Several experienced researchers and professors checked the content validity. One case study was conducted as a pilot study; during this case study, several changes were made to the structure of the questions based on the participants' responses. In addition, a bi-lingual expert verified translated transcripts of the focus groups and interviews because these were conducted in Urdu, the first language of the participants.

3.6.3.5 External Validity

External validity refers to the generalization of the findings of the study. In statistical studies, often generalization is made to larger audiences; however, in case study research, the generalization of the findings means something different. Yin (2009) calls it analytical generalization where the results of a multiple case study may be generalizable to the broader audience in terms of an extension to the existing theory. A case study design that replicates two or three cases has a greater probability of concluding generalizable results to extend the theory than does a single case design. In this study, a multiple case study design has been chosen which gives this study external validity. Three cases are studied in this research and the design is replicated with the same set of operational measures being applied to each of the selected cases. Furthermore, the findings of this research will contribute to the body of knowledge in the field of mobile learning, particularly for developing countries where little research has been done in this domain so far.

3.6.3.6 Reliability

The reliability of a research design allows other researchers to verify the results of the study by applying the same data collection procedures and obtaining the same results. The main purpose is to ensure reliability by reducing the risk of bias in data collection, refining the data collection instruments and making the research process transparent for the other researchers. For this research, the reliability has been ensured by using the same data collection approaches such as focus groups and individual interviews in each of the case investigations.

3.6.3.7 Contacting the Organizations

In relation to contacting the universities, it was easy to access the private sector university; however, access to the public sector universities and their personnel was difficult, especially in terms of securing appointments for the interviews. For the focus groups however, the lecturers were contacted to assist with the recruitment of the participants and facilitate the process of data collection on case study sites.

3.6.3.8 Participants' Recruitment

Initially, the lecturers in the respective universities were contacted to assist with the participants' recruitment and data collection; therefore, it was a relatively easy for them to contact their students and colleagues. Most of the student participants were enrolled in Electrical and Telecom Engineering, Computer Science, and Dentistry programs. The participants from Electrical and Telecom Engineering were in the 3rd or 4th year of their program whereas the Computer Science students were in year 1 and year 2. The Dentistry students were enrolled in year 1 of the program and had just begun their studies. The purpose of the selection was to include a variety of students from different programs and different levels of university studies so that the data could reflect multiple viewpoints. The participants received an email invitation with an information sheet (See Appendix A) outlining the purpose of the research, assuring confidentiality of the participants' personal information and their right to withdraw from the research participation.

In terms of individual interviews it was more difficult to obtain appointments and interview times with the university personnel in administrative positions such as IT Managers and other senior administrative positions and policy making roles because of the nature of their jobs and their busy schedules.

3.6.3.9 Field Procedures

Several field work and data collection activities were conducted simultaneously given the time, and budget constraints. For instance, the focus group discussion sessions were conducted with students and teachers by visiting each of the three universities, (see Table 4 for details of focus groups discussion sessions with students

and teachers). In the final stage of the field procedures, the stakeholders including administrators and IT managers were unavailable during the field visit; therefore, their interviews were conducted on Skype later on. On-site visits for conducting multiple focus group sessions proved to be an opportunity for detailed observation of the organizational environment and its conduciveness to the prospective inclusion of mobile learning.

3.6.3.10 Pilot Study

The first university was treated as a pilot study. When the data collection procedures were completed, a summary of these procedures was provided to the supervisors. Subsequent to the initial draft of the pilot case study report, the supervisors recommended that several changes be made to the focus group questionnaires. These changes involved altering the sequence of a few questions as the initial data indicated that two related issues may be grouped together. The changes were made to the questionnaires for the rest of the focus group sessions. Similarly, changes were made to the questionnaires for the individual interviews.

3.6.3.11 Focus Groups

The focus group is a qualitative research technique used to collect data through group interaction where the researcher provides the focus or theme and sometimes plays the role of moderator during discussion. Focus groups can be used as a primary source of data as well as a complementary data source in a research design using multiple data collection techniques such as interviews and participant observation (Morgan 1997).

Krueger and Casey (2000) argue that focus groups are more suitable if the researcher is interested in knowing the trends, attitudes and perceptions of people. Both of the above arguments support the inclusion of focus group interviews as a data collection technique in this research. The main participants of the focus groups for this research include university students, teachers and the university administrators; and the main objective of the study was to explore their perceptions and expectations of mobile learning in their universities.

Focus groups also have some limitations; for instance, some participants may have an influence on the point of view expressed by others in the group or may be afraid to express their honest opinion (Morgan 1997, Krueger and Casey 2000). Other limitations on the part of the investigator may include difficulty in settling any conflicts between individual and group opinions, making it difficult to conclude findings (Litoselliti 2003). It is important that the researcher acknowledge these limitations and keep these in mind during the focus group discussions; this requires mastering the skills of moderating the focus group discussion sessions (Morgan 1996, Krueger and Casey 2000). Further, the limitations of focus groups could adversely affect the validity of the research findings unless the research design includes evidence from other data sources such as interviews to substantiate the findings from focus groups (Morgan 1997).

The focus group discussions were a key element of this case study research. Focus groups were planned and conducted during the first phase of data collection. The students and the teachers from the three universities were the main participants in the focus group discussion sessions. One student focus group and one teacher focus group were conducted for each of three selected universities comprising six focus group discussion sessions in total. For each focus group discussion session, 13 participants were invited to participate in the focus group session. The average attendance for students was nine participants for each focus group. The average attendance for the teachers' focus group sessions was 10. Teachers proved to be more professional and responsible in terms of turning up on the day for the focus group sessions. The students, however, produced various reasons for not showing up such as assignment deadlines and a clash of the focus group discussion time with lecture timings, although their availability was confirmed before scheduling the respective focus group sessions. The participants were provided with another copy of the participant information sheet in case they missed the soft copy emailed to them earlier. The participants signed the consent forms before the beginning of the sessions. Copies of Participants Information Sheet, Cover Letter and Consent Form have been attached as Appendices A, B and C with this thesis. A copy of the questionnaires for students and teachers was also provided to the participants for reference during the discussion (see Appendices D and E).

Table 5: Focus Groups Schedule and Participants Demographic Information

Focus Group ID	University	Date	Duration	Number of Participants	Faculty
Student-FG1	University A	07-01-2011	55 Minutes	10	Engineering
Student-FG2	University B	14-12-2010	70 Minutes	08	Engineering
Student-FG3	University C	16-12-2010	50 Minutes	06	Dentistry
Teacher-FG1	University A	08-01-2011	85 Minutes	08	Engineering
Teacher-FG2	University B	09-12-2010	91 Minutes	10	Engineering
Teacher-FG3	University C	08-12-2010	86 Minutes	10	Dentistry

All of the focus group discussion sessions were audio recorded. A summary of participants' demographic information and data collection schedule has been recorded in Table 5.

3.6.3.12 Interviews

Interviews are considered the most common and the most important source of data in a case study research design. Interviews provide focused answers to the researcher's line of inquiry and the researcher has the opportunity to seek further explanation from the interviewee for clarity and conciseness (Miles and Huberman 1994). Oates (2006, 187) lists three major categories of interviews: *structured*, *unstructured* and *semi-structured.* Structured interviews adhere to pre-defined questions; whereas the other two types are guided discussions where the investigator maintains his/her own line of inquiry while continuing the interview in a conversational manner (Yin 2009). Unstructured and semi-structured interviews are the most suitable for exploratory research (Oates 2006). Thus, semi-strucutred interviews have been included as an important data collection technique in this research design. The main interviewees are the stakeholders from the universities in order to gain an insight into the universities' perceptions and expectations of mobile learning implementation in the future.

Miles and Huberman (1994) argue that interviews have limitations, one of which is the bias of the interviewee which may produce an inaccurate response. Also, the investigator could ask leading questions, thereby manipulating the original and genuine opinion of the interviewee; this problem is termed as reflexivity. An effective way of overcoming these limitations is to triangulate with other data sources included in the case research design such as focus groups and direct observations (Yin 2009, 102).

For this research, interviews are a main source of data. After the focus groups discussions with students and teachers, the semi-structured individual interviews were conducted with the other stakeholders of the universities including administrators, IT managers and instructional designers. Personnel were invited by email to participate, and were provided with an information sheet, cover letter and consent form (see Appendix A, B and C).

Table 6: Interview Schedule and Participants Demographic Information

Stakeholder Title	**Designation**	**University**	**Interview Date**	**Duration**
Instructional Designer	Assistant Professor	University A	07-05-2012	40 Minutes
Administrator	Managing Director	University A	03-08-2012	35 Minutes
IT Manager	Network Administrator	University A	15-05-2012	30 Minutes
Instructional Designer	Assistant Professor	University B	31-07-2012	40 Minutes
Administrator	Dean of Faculty (Telecommunication and Electrical Engineering)	University B	27-09-2012	45 Minutes
IT Manager	Network Administrator	University B	24-07-2012	30 Minutes
Instructional Designer	Medical Doctor/Registrar/Lecturer	University C	12-05-2012	40 Minutes
Administrator	Dean of Faculty (Medicine)	University C	23-06-2012	30 Minutes
IT Manager	Network Administrator	University C	29-05-2012	30 Minutes

Interviews were conducted online using Skype software. Interviews were audio recorded with the permission of the participants. However, some of the participants did not wish to record their interview and preferred to write their responses to the interview questions. Table 6 provides a precise picture of participants and data collection activities during this phase of data collection. Interview questions for administrators, IT managers and instructional designers have been included in Appendices F, G and H with this thesis.

3.6.3.13 Documents

Documents are another important source of information for a case study researcher. Documents may be useful for any type of case study and may take many different forms such as emails, minutes of meetings, organizations' internal progress reports and other administrative documents which may assist the case study researcher to augment the data collected by other sources and which provide additional information on the same topic (Yin 2009, Miles and Huberman 1994, Oates 2006). Yin (2009) recommends that the case study researcher should examine already available documentary evidence (i.e. via internet search, browsing websites and progress reports available online) before entering the case study site. In this research, the websites of the selected universities were reviewed to obtain information about the ranking of universities before the selection of case study sites. Further, several organizational documents such as progress reports were reviewed during the visits to the case study sites. A number of publicly available documents such as press releases from the websites of Pakistan Telecommunication Authority about the ICTs in Pakistan, World Bank and Pakistan Higher Education Commission were also reviewed (PTA 2009; WorldBank 2011; HEC 2009). References to these sources have been made in the results and discussion chapters where appropriate.

3.6.3.14 Direct Observation

A case study investigator has the advantage of being a direct observer of the case study site during the data collection activities. Yin (2009) mentions that the observations may be made during the whole process of conducting the case study; for instance, the case study researcher may observe the office of the interviewees during the interview, take photographs (with permission) of activities being carried out on

the case study site. Direct observation is an important data source, and could assist the researcher to confirm the findings from other sources of data. In this research, the evidence actual observation during the data collection was also drawn upon. For example, the use of mobile devices for learning by the students in the universities and even during the focus group discussion sessions to demonstrate learning activities.

3.6.4 Data Analysis Process

The establishment of modes and strategies to be used for data analysis during the design stage is very helpful and makes the researcher mindful of the data analysis process for the field procedures and data collection phase (Benbasat, Goldstein, and Mead 1987). Yin (2009) has offered several data analysis strategies, techniques and tools to embed in a variety of case study research designs such as using theoretical framework to guide the analysis and using a pattern matching technique for coding the data. Similarly, Bogden and Biklen (1982) have discussed several discrete steps invovled in qualitative data analysis including working with data, organizing data, synthesizing data and interpreting data.

Ryan and Bernerd (2003) have elaborated on the multiple techniques and strategies used to identify themes emerging from qualitative data for different types of qualitative data including both rich verbal narratives and brief text. Lacey and Donna (2001) have described multiple stages of qualitative data analysis from transcription of audio/video interviews to organizing data, followed by coding and identification of themes and interpretation of data by the researcher.

Miles and Huberman (1994) have proposed similar techniques and strategies for the preparation ans organization of data at this stage. By incorporating all of the important techniques, strategies and stages from the literature suitable for the type of data in this research, a nine-stage (see Table 7) data analysis process has been devised for the data analysis of this research in order to ensure the rigor of the data analysis process.

Table 7: Stages in Data Analysis for This Research (Adapted from: Bogden and Biklen (1982), Miles and Huberman (1994), Yin (2009), Ryan and Bernerd (2003), Lacey and Donna (2001))

Stage No	**Stage Name**
Stage-1	Choosing Data Analysis Strategies
Stage-2	Choosing Data Analysis Tools
Stage-3	Preparing Data
Stage-4	Organizing Data
Stage-5	Coding Data
Stage-6	Identification of Themes
Stage-7	Synthesizing Data
Stage-8	Interpreting Data
Stage-9	Writing the Results

The following subsections provide detailed explanation for each stage of data analysis process for this research.

3.6.4.1 Choosing Data Analysis Strategies

Two main data analysis strategies have been chosen. Firstly, a theoretical framework technique is used to guide the analysis of data, and secondly, the technique of pattern matching is used to assist the researcher to code the data based on themes identified earlier in the literature. The details of how these data analysis strategies have been implemented in this research are presented in the following sections.

Data Analysis Strategy 1: Using Theoretical Framework/Model

Prior to conducting a case study research, the formulation of a theoretical framework is needed to serve the multiple purposes of the research. For instance, the process of developing the theoretical framework involves a comprehensive examination of the literature to reveal existing theories and the possible extension of those theories. In addition, the theoretical framework provides a blueprint as a guide for the whole research process which includes articulating the research questions, establishing hypotheses (if applicable), propositions or themes, determining the data type, and data collection and data analysis techniques. Yin (2003) states that there is a lack of

a strong theoretical base to inform the design of the exploratory case studies; therefore, the researcher is less likely to provide theoretical statements, hypotheses and propositions at the outset of the case study design. This logic is applicable to this research; hence, a theoretical framework based on the existing literature on mobile learning was developed and themes provided instead of formal propositions to guide the research process, data collection and basis for analysis of the data.

The theoretical framework called 'initial mobile learning conceptual model' in this research (see Figure 10) is a combined adaptation from Danaher et al. (2009), Sharples et al. (2005), Barker et al. (2005) and Koole (2009). A detailed description and rationale for this theoretical framework was presented in Chapter 2. This theoretical framework has provided the baseline for the main building blocks of the research design including the identification of units of analysis, the themes to be considered when designing questionnaire/instruments, and the choice of appropriate data collection and analysis techniques.

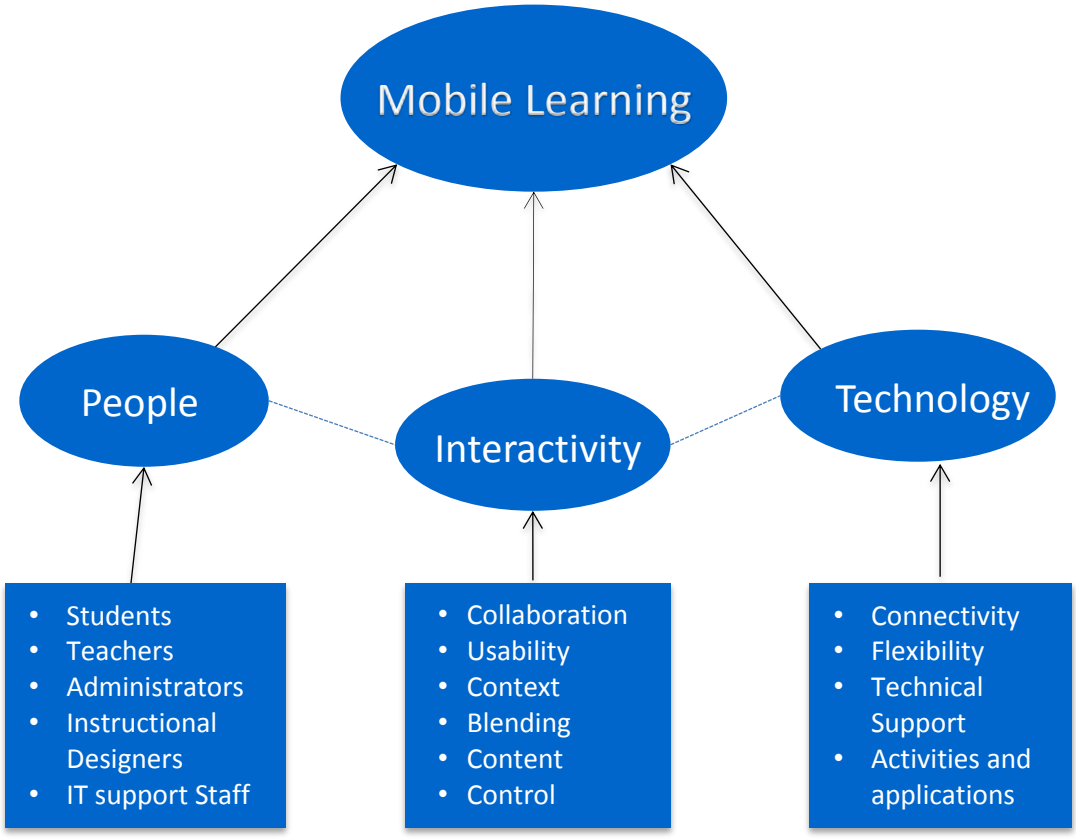


Figure 10: Initial Mobile Learning Conceptual Model. (Adapted from Danaher et al. (2009), Sharples et al. (2005), Barker et al. (2005) and Koole (2009)

This initial mobile learning conceptual model (Figure 10) assisted with the data analysis (See details in section 3.6.4.3) process and helped to structure the forthcoming discussion and findings chapters. Subsequent chapters that include discussions and findings are as follows: Chapter 4 for the students' focus groups, Chapter 5 for the teachers' focus groups, and Chapter 6 for the results, discussion and findings from the individual interviews of administrative stakeholders in Pakistani universities.

Data Analysis Strategy 2: Coding Using Pattern Matching Technique

As for the second data analysis strategy, in the literature, pattern matching has been found to be the most popular method for analysing case study data; pattern matching enhances the validity of the case study (Miles and Huberman 1994; Yin 2009).

Using this pattern matching data analysis technique, mobile learning characteristics were mainly grouped and coded under the categories of 'Interactivity' and 'Technology' (following the model in Figure 10) based on the major themes from the focus group discussion sessions and individual interviews. However, for the 'People' category (available in the model in Figure 10), there was no separate coding because it contained the participants' details which included those of students, teachers, IT managers, instructional designers and university administrators.

Participants or 'People' discussed their perceptions and expectations regarding mobile learning characteristics such as collaboration, usability, context, blending, flexibility, connectivity and mobile learning applications; therefore, the coding for the 'People' category was embedded in the coding for all other categories and themes. It is important to note that a discussion about the 'People' category has not been included separately in the discussion and findings chapters as this would have been redundant. Furthermore, all of the discussions and findings frequently refer to these participants.

3.6.4.2 Choosing Data Analysis Tools

It is important for a qualitative data analyst to be mindful of the available data analysis tools for the qualitative research given that the quantitative data has been collected. A number of data analysis tools or computer software packages have become popular in the qualitative research community. It is important to understand that the data analysis tools do not perform the analysis for the researcher; their purpose is to assist researchers to organize the data and build coding and categories (Lacey and Donna 2001; Yin 2009). However, these tools are quite useful and assist the researcher to plan the data analysis, manage the large amounts of text data, categorize and code the text and ultimately help to implement the data analysis strategies and techniques.

For this research, the tools for qualitative data analysis NVivo 9.2 and NVivo 10 versions for text analysis have been used. The appropriate training in the use of this software was acquired during the course of the case study investigation and the skills of data analysis were applied using this tool. NVivo software helps the researchers to organize and understand the research data for better decision-making (QSR International 2012). This tool helps with the organization of the text data from sources (focus group discussion transcripts and individual interview transcripts) to categorize themes, coding, and classification of nodes and sources of data, building relationships and associations between nodes, and building the various models for pictorial representation of data. QSR NVivo 10 has been used as the main data analysis tool for this research. In addition, Microsoft Excel 2010 and Microsoft Word 2010 have been used to assist in the data analysis for this research. An Urdu language word processing software call InPage Urdu 2009 was used to transcribe initial text from recorded interviews.

3.6.4.3 Preparing Data

The preparation of data is an important step in the data analysis. It has several benefits such as saving time during the actual analysis and get the research familirize with and knowing the data which is essential for the analysis process (Lacey and Donna 2001; Bogden and Biklen 1982), Anne and Donna). The audio recordings were transcribed in the Urdu text format by using InPage 2009 Urdu text editor. It

was a long and painstaking process to learn using this software package call InPage Urdu 2009. Transribing and writing Urdu text into the software from the recordings was hectic and time-consuming process. After the Urdu text for all focus groups and individual interviews had been transcribed, the transcriptions were translated into English. The final version of the transcripts' translation was checked, reviewed and verified by a bi-lingual expert who is a lecturer of English as a Second Language in a Pakistani university.

3.6.4.4 Organizing Data

In the qualitative data analysis process, organizing data is an equally important and essential stage as that of data preparation. Organizing data involves preparing the transcripts to be imported into analysis software and assinging meaningful codes and titles to the files to make them ready to work with (Lacey and Donna 2001; Miles and Huberman 1994; Bogden and Biklen 1982). For this research, data was organized in several ways such by assigning meaningful titles to each transcript file and compiling data colleciton information separately for each focus group session and interview session (refer to Table 5 and Table 6 for detailes).

Furthermore, meaningful codes and titles were assigned to the Universities, focus group participants and interviewees for indentification and referencing during the analysis. For instance, universities were assigned the codes of University A, University B and University C to ensure anonymity. Similarly, meaningful codes were generated for students' and teachers' focus group participants such as Uni A – Student1 and Uni B – Teacher2. Interviewees were labeled in the similar fashion such as university code followed by designation of the interviewee e-g Uni A – Administrator or Uni B – IT Manager. These codes were used for the data analysis and for reporting the results in Chapters 4, 5 and 6 when quoting the participants. In this stage, a new project file was created in NVivo software and named according to the topic of the research. All the prepared and organized transcripts were imported into the NVivo software as data sources.

All the raw data including original recordings, Urdu language transcripts, initially translated transcripts, organized and labeled transcripts were organized and stored in separate folders for each university and relevant focus groups. A back-up of all the

data was made on a separate disc and on cloud storage (DropBox and SkyDrive) before the start of data analysis.

3.6.4.5 Coding Data

In the data organizaiton stage, all of the transcripts were imported to NVivo software. Data was ready to be coded respectively. According to Ryan and Bernerd (2003, 4), coding is the process of identifying potential themes present in the data. Some of the themes could also be pre-identified on the basis of the theoretical framework emerging from the literature review to start with the data analysis.

> *'Themes come both from the data (an inductive approach) and from the investigator's prior theoretical understanding of the phenomenon under study (an a priori approach). A priori themes come from the characteristics of the phenomenon being studied; from already agreed on professional definitions found in literature reviews; from local, common-sense constructs; and from researchers' values, theoretical orientations, and personal experience'*

However, pre-identified themes should not stop the qualitative research from seeking new and emergent themes in the collected data (Ryan and Bernerd 2003; Welsh 2002). For this research, both of the techniques were used for coding data. Firstly, as informed by one of the selected strategies for this research to use theoretical framework, pre-identified categories and themes based on the intial mobile learning conceptual model (refer to Figure 10 in Section 3.6.4.1) were used. During the coding process, new and emerging categories, themes and subthemes informed by data were acknowledged and added. The process of coding data involved several mini-steps. Firstly, nodes were created based on the initial categories and themes used in the theortical framework or initial mobile learning conceptual model (Figure 10).

A pattren-matching strategy was used to code the data. To code the data for respective nodes, the option of auto-coding available in NVivo was initially used to group the text according to the relevance of themes. However, after a detailed review of the results of manaul auto-coding, it was apparent that auto-coding relied on a specific algorithm of searching for similar words to group the text under each

theme. This was not a very effective way of coding as it missed several themes and chunks of text related to a theme where participants used colloquial language and slang to express their opinion about an important theme.

Basit (2003) argues that electronic data analysis software packages could only assist in managing the large amounts of textual data in qualitative research; however, the need for and importance of deliberation and decision-making on the part of the researcher is imperative in order to find themes and ultimate theoretical underpinnings of data. Cope (2005) also recommends similar techniques for coding qualitative data. Therefore, the results of auto coding were disregarded. Instead, manual coding was used where every piece of transcribed text was read manually and coded according to the relevant theme using the pattern-matching technique. Figure 11 shows the screen shot of the nodes as a result of manual coding in NVivo 10 software. This example displays the data analysis process for students' focus groups.

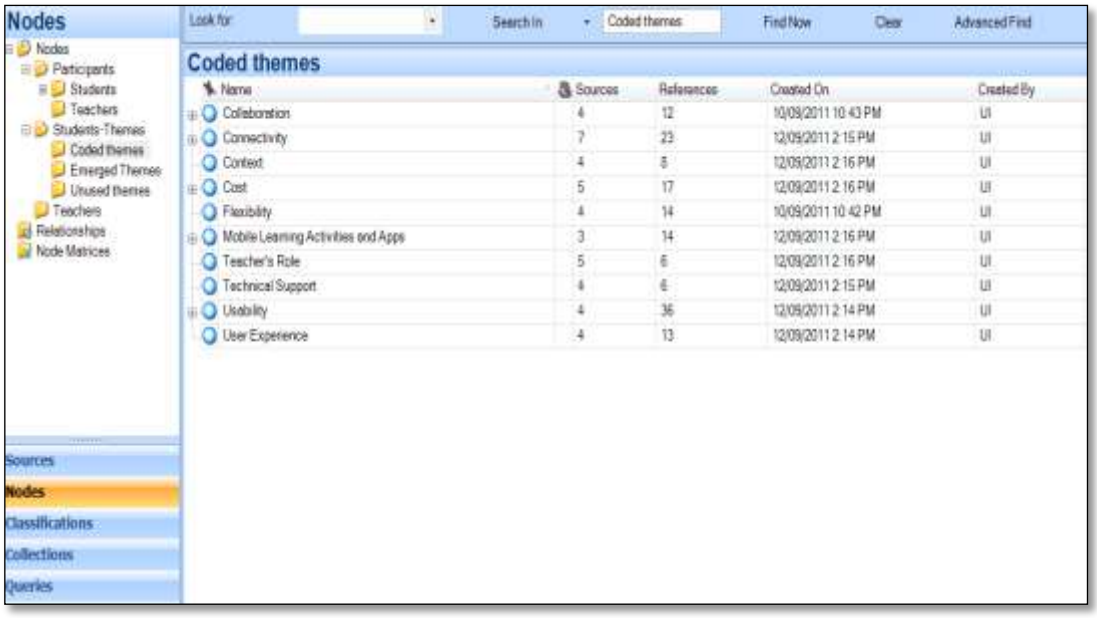
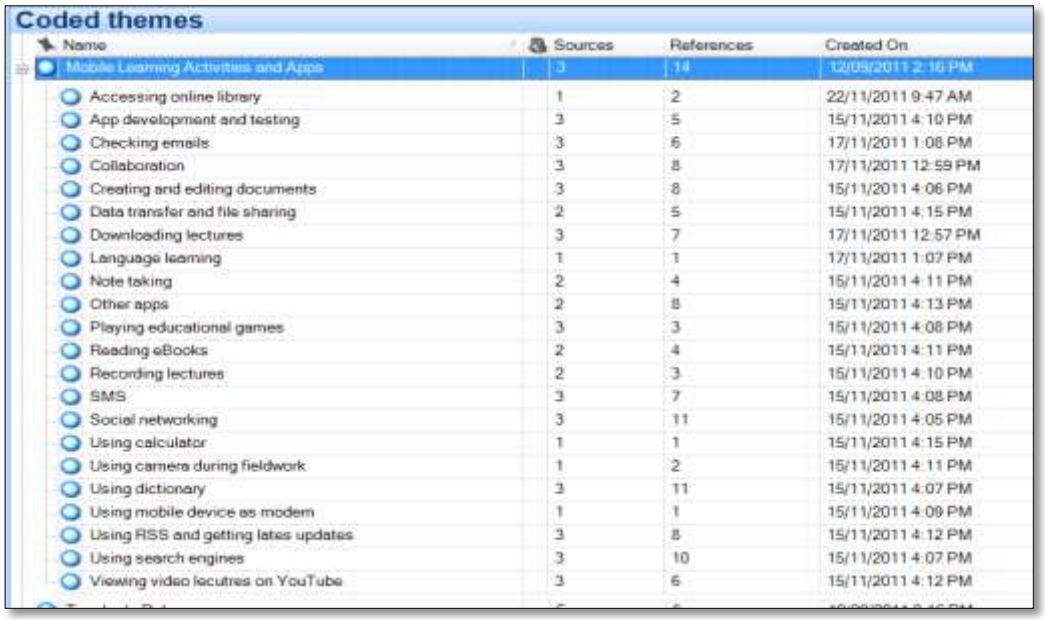


Figure 11: Main Coded Themes for Students Focus Groups Analysis

Figure 12 is another exmaple of mobile learning activities and applications derived from the data based on manual coding.



Coded themes

Name	Sources	References	Created On
Mobile Learning Activities and Apps	3	14	12/09/2011 2:16 PM
Accessing online library	1	2	22/11/2011 9:47 AM
App development and testing	3	5	15/11/2011 4:10 PM
Checking emails	3	6	17/11/2011 1:08 PM
Collaboration	3	8	17/11/2011 12:59 PM
Creating and editing documents	3	8	15/11/2011 4:06 PM
Data transfer and file sharing	2	5	15/11/2011 4:15 PM
Downloading lectures	3	7	17/11/2011 12:57 PM
Language learning	1	1	17/11/2011 1:07 PM
Note taking	2	4	15/11/2011 4:11 PM
Other apps	2	8	15/11/2011 4:13 PM
Playing educational games	3	3	15/11/2011 4:08 PM
Reading eBooks	2	4	15/11/2011 4:11 PM
Recording lectures	2	3	15/11/2011 4:10 PM
SMS	3	7	15/11/2011 4:08 PM
Social networking	3	11	15/11/2011 4:05 PM
Using calculator	1	1	15/11/2011 4:15 PM
Using camera during fieldwork	1	2	15/11/2011 4:11 PM
Using dictionary	3	11	15/11/2011 4:07 PM
Using mobile device as modem	1	1	15/11/2011 4:09 PM
Using RSS and getting lates updates	3	8	15/11/2011 4:12 PM
Using search engines	3	10	15/11/2011 4:07 PM
Viewing video lecutres on YouTube	3	6	15/11/2011 4:12 PM

Figure 12: Manually coded nodes for mobile learning activities and applications from Students Focus groups

The stage of coding data and the next stage of indentification of themes are inter-related and overlapping. As mentioned earlier in this section, some of themes were identified based on the initial model. The next stage invovles the identification of new themes, sub-themes and iterative process of detailed coding.

3.6.4.6 Identification of Themes

According to Ryan and Bernerd (2003), themes are the specific concepts found in the text. Themes can be identified from several pointers in the data including expressions, repetitions of certain concepts by the participants, indigenous typologies or local language terminologies and similarities and differences of the opnions of the participants. In the data analysis for this research, these techniques were applied to delve into the data in order to identify new themes in addition to using pre-identified categories and themes.

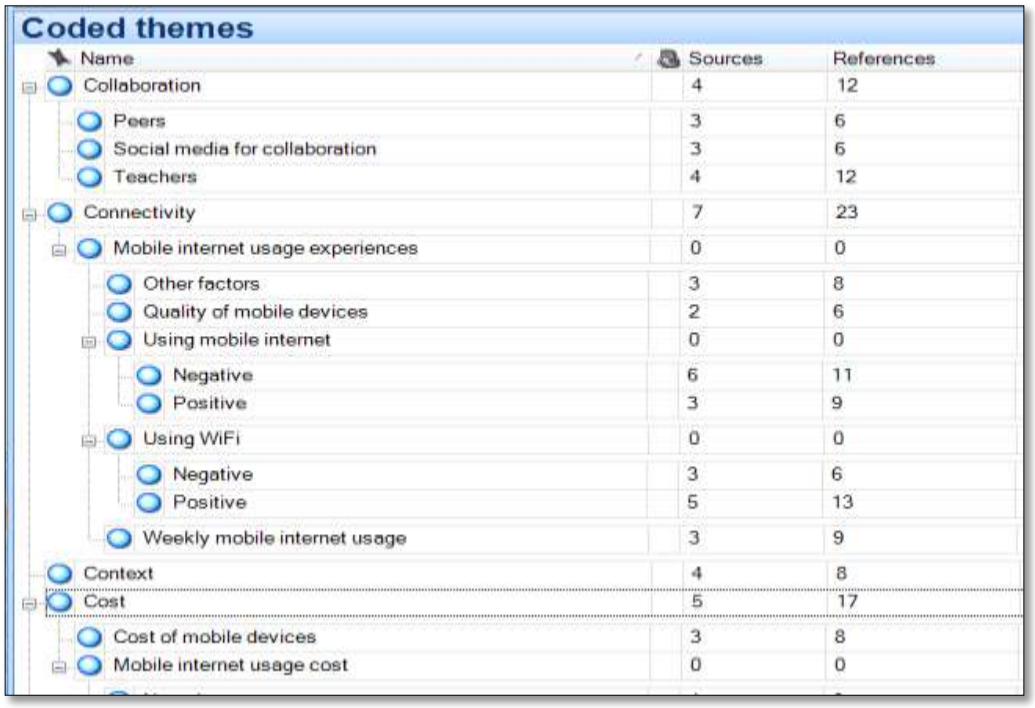


Figure 13: Child Nodes for Sub-Themes for Students Focus Groups Analysis

3.6.4.7 Synthesizing Data

The next stage involved synthesizing the data in terms of building relationships among different nodes and themes (Bogden and Biklen 1982). After the identification of sub-themes and the creation of child nodes, the relationships among multiple nodes were identified.

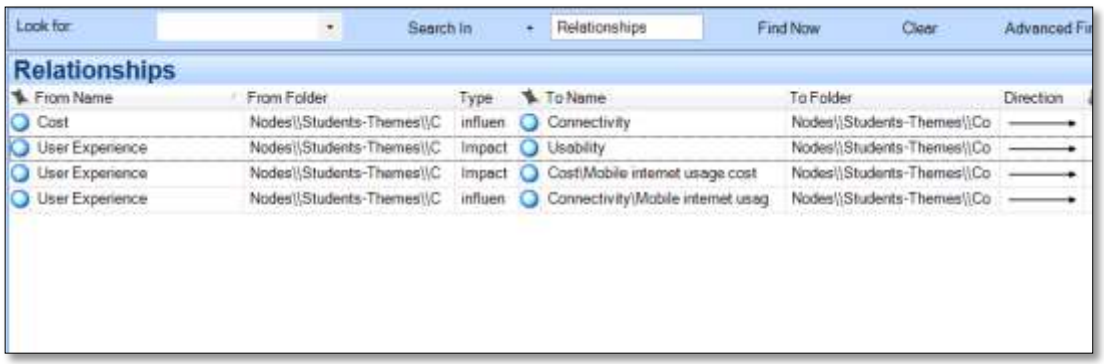


Figure 14: Relationship between Themes for Student Focus Groups Analysis

For instance, the relationship between the user experience and usability was evident from the participants' opinions that the students who already possessed the smart phones were experienced users; they reported fewer usability issues of mobile

devices for learning. Figure 14 shows some of the relationships constructed during the data analysis for the students' focus groups.

NVivo provides a feature that allows the viewing of multiple inter-connected themes and nodes in the form of diagrams and models. A typical mode representing the hierarchy of relationships among multiple nodes is called *Node Strucure* in Nvivo. For the analysis process in this research, models were generated in order to see the inter-dependence of different nodes from the relationships built earlier. For example, to visualize the usability issues discussed by the students during the focus groups interview sessions, the usability tree in Figure 15 was developed to observe the usability node and associated child nodes.

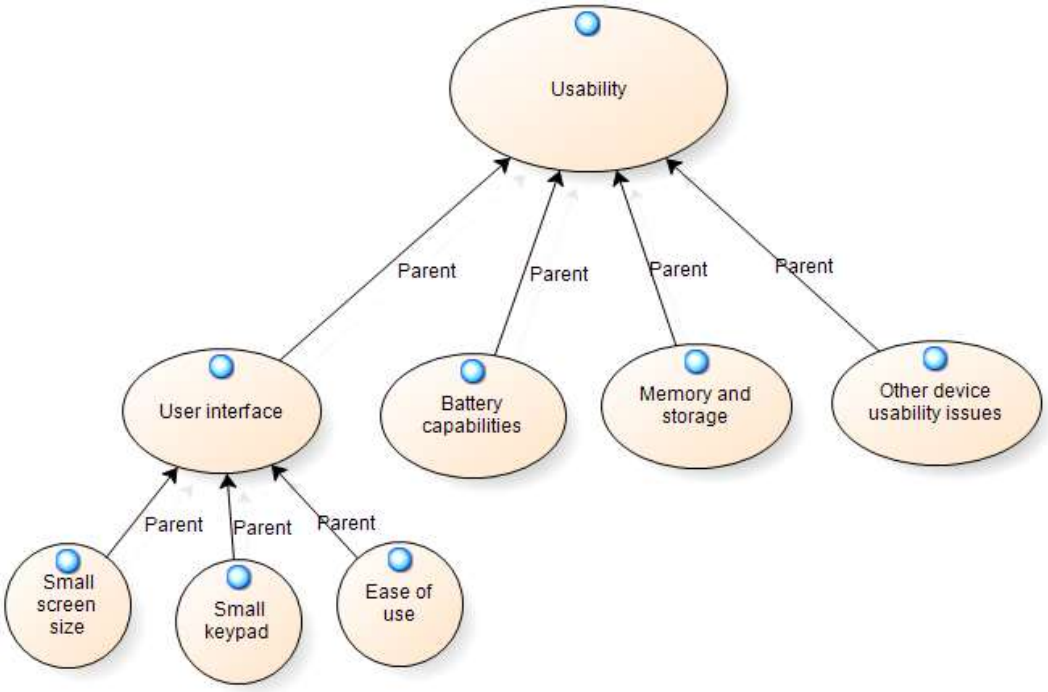


Figure 15: Usability Tree – An Example of Node Structure

Similarly, another model was created to visualize the relationship and impact of certain inter-related themes such as user experience, technical support, cost and usability (see Figure 16 on the page 88)

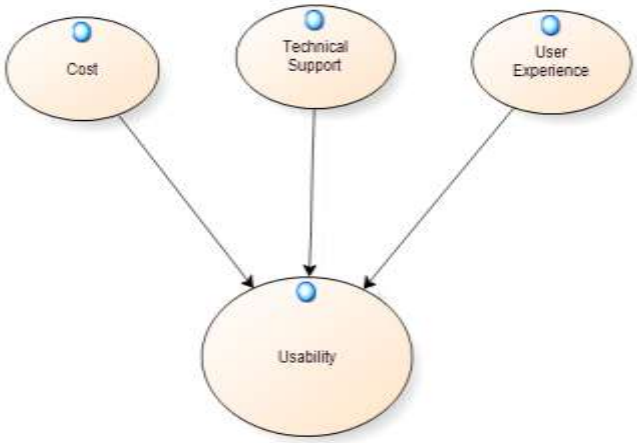


Figure 16: Factors impacting on students' perceptions of usability - An Example of Modelling the Relationships among Multiple Nodes

Building relationships and visualizing them as models and node strucuture diagrams assisted with the next stage of the data analysis which is the interpretation of the results.

3.6.4.8 Interpreting Data

NVivo has another key feature allowing the data analyst to record the reflective comments and interpretation of the data at the time of coding (QSR 2013; Welsh 2002). An annotation can be written in the form of comments or sticky notes and attached to each related node. Similarly, a memo can be written in Nvivo to write the comments and interpretation of particular chunk of data and attached to the data to refer to it later during the write-up. Memo writing proved to be very important from the data analysis stage to the write-up of the research results in this thesis. Initial thoughts were recorded as memos for each node and theme during the analysis process; these memos were updated and used to report the results of the analysis in the subsequent chapters (4, 5 and 6) in this thesis. Figure 17 (on page 89) presents a screenshot of information about memos written during the analysis of data in NVivo 10.

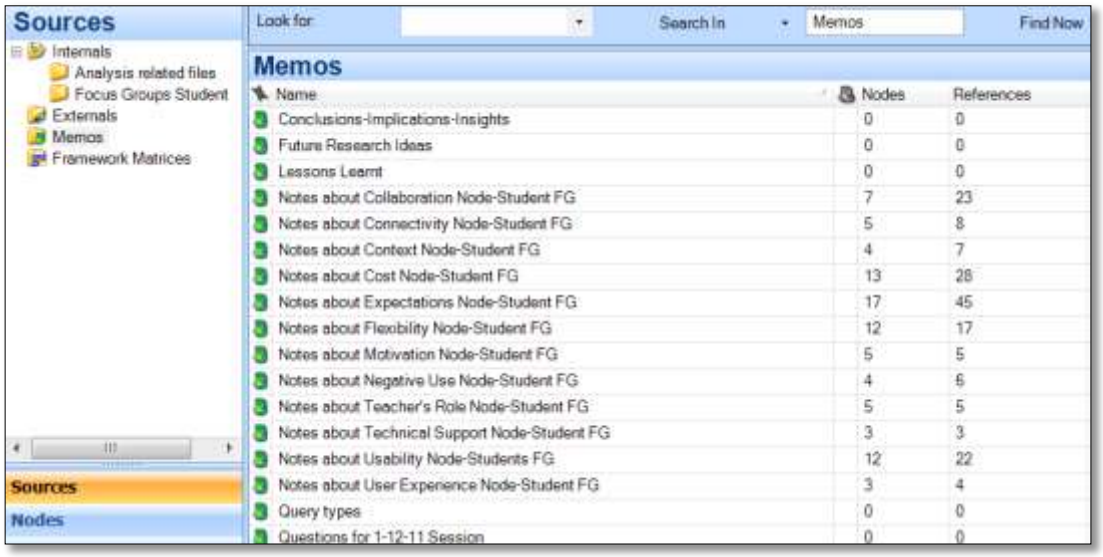


Figure 17: Memos Written during Students Focus Groups Analysis

During this stage, important quotations were also selected and highlighted along with memos for use in the results and discussion chapters of the thesis.

3.6.4.9 Writing the Results

Finally, communicating the results of the analysis to the audience is another crucial step to conclude the data analysis process (Gurdial and Jones 2007). In this thesis, Chapters 4, 5 and 6 have been written to present the results of this research in form of direct quotations from the participants as an outcome of the data analysis process. Further, the dicussion of the results has been presented with relevant references to the literature. In order to be consistent with the selected strategy for the data analysis process such as using theoretical framework to guide the analysis, similar strategy was used to strutcutre the results and discussion chapters (4, 5 and 6) in this thesis. Ultimately, a new Mobile Learning Framework (refer to Figure 40 in Chapter 7) was developed demonstrating both the existing and new themes that emerged as outcomes of this research.

3.7 Ethical considerations

The ethics approval policy at Curtin University was followed during the entire process of this research. Questionnaires were prepared and subsequently approved by the Ethics Committee of the Curtin Business School. Participants were informed

of the research study. Information sheets were circulated before the actual data collection procedures began. Participants gave their written consent to voluntarily participate in the research and they were informed of the right to withdraw their participation from the research at any stage. The contact information of the researcher and the supervisors was provided to the participants in case of further queries or concerns. All collected information and data were kept confidential with the researcher and supervisors.

3.8 Research process flow chart

The flow of the research process is presented in Figure 18. This research included four main phases. Phase 1 comprises the literature search, review and development of the initial mobile learning conceptual mode.

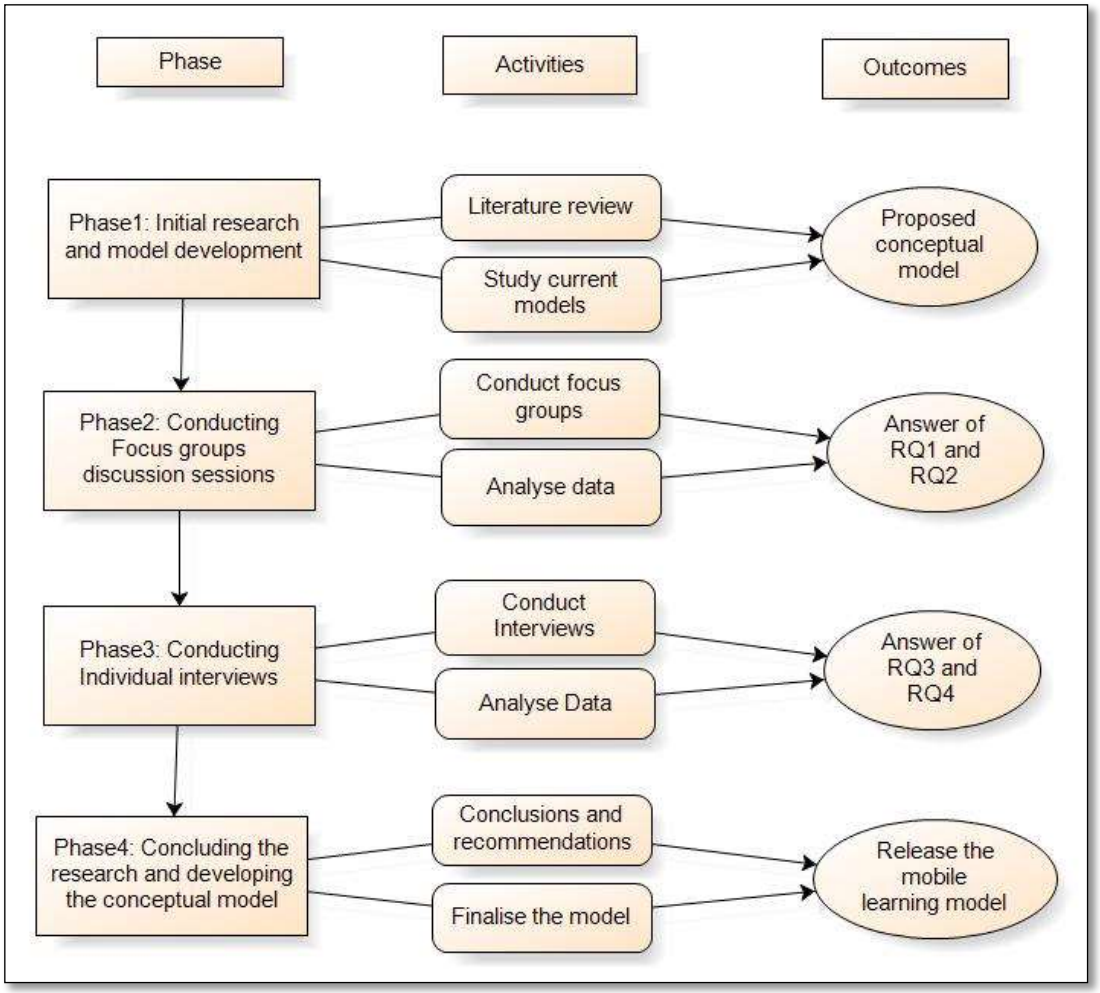


Figure 18: Flow of Research Process

Data was collected during Phase 2 and Phase 3 and included focus group discussion sessions and individual interviews. Data from these phases was analyzed in order to answer the research questions. The final phase comprises the conclusions drawn from the research findings, and the development and release of the final mobile learning conceptual model as the outcome of the research.

3.9 Chapter Summary

Mobile learning is a multi-disciplinary field of research as researchers from the Information Systems, Human-Computer Interaction, Telecommunication Engineering and Education disciplines have been collaborating in mobile learning research studies. Moreover, Information Systems research is also very rich in diversity and input from other disciplines. This research is multi-disciplinary and relates to the Mobile Learning and Information Systems fields. With its orientation in the Information Systems field, this research is interpretivist in nature. The case study approach has been selected as the research method and qualitative data has been collected through multiple data collection techniques including focus groups, semi-structured individual interviews and observations. A number of mobile learning researchers have used the case study approach as the research method and qualitative data collection and analysis techniques. For the data analysis, the initial mobile learning conceptual model from the literature has been used to guide the analysis and structure the subsequent discussion and findings chapters. NVivo, Inpage Urdu, Microsoft Word and Microsoft Excel have been used as data analysis tools for this research. A rigorous nine-stage data analysis process was followed from the preparation and organization of data for the analysis to coding, identification of themes, interpretation of the data and writing the results. The flow of overall research process has been explained in Figure 18 (on page 90). This research is approved by the Curtin University Ethics Committee.

CHAPTER 4 STUDENTS' FOCUS GROUPS: RESULTS, DISCUSSION AND FINDINGS

4.1 Introduction

The previous chapter was dedicated to the discussion and selection of research methods, research design issues, data collection approaches and activities including demographic information about the three students' focus groups, three teachers' focus groups and nine individual interviews from university administrative stakeholders. In this chapter, the findings from the focus group interviews conducted with students studying in Pakistani universities are presented and discussed. Primarily, the chapter is focussed on addressing and answering the first research question: '*What do the students perceive and expect of mobile learning in Pakistani universities?'* This chapter, and the subsequent findings/discussion chapters, follow the conceptual model to structure the chapter (see Figure 9 in Chapter 2). A rigorous data analysis process using NVivo qualitative data analysis software has been followed to obtain the results and findings presented in this chapter. Section 3.6.4 in Chapter 3 presents a detailed account of strategies, techniques and stages in the data analysis process with examples and screen shots from NVivo to elaborate the analysis process. This chapter is focussed on the discussion of the results and findings of focus group interviews with students studying in universities in Pakistan. Discussion and findings for the teachers' focus groups and interviews with administrative stakeholders will be presented in the subsequent chapters.

As the nature of the collected data is purely qualitative, it is important to mention at the outset that the discussions and findings in individual sections may contain different terminologies especially in relation to the level of agreement among participants regarding a particular certain characteristic, concern, experience, theme

or expectation (Dudley and Nikita 1999). For example, weak support for or agreement with an argument is indicated by the expression *one of the participants mentioned;* moderate support is indicated by *some of the participants or a few participants* and strong agreement is expressed by terms such as *the majority of the participants/all of the participants/the participants*.

Each section of this chapter will present a detailed account of the students' perceptions and expectations of mobile learning characteristics in Pakistani university environments. The discussion may include references to the relevant literature followed by a short summary of discussion and findings. Besides the planned questionnaire for student focus groups based on the initial mobile learning conceptual model, several other themes emerged during the focus group discussion sessions. Some of these newly-emerged themes indicate socio-cultural trends and their impacts. Section 4.12 and subsections include the details of themes that emerged from data gathered from the students' focus group sessions. A summary encompassing the various findings will conclude the chapter.

4.2 Collaboration - Results and Discussion

Students from three focus groups in Pakistani universities generally talked about various forms of collaboration for which they were using their mobile devices. During the analysis of data, three main areas of collaboration were found: collaboration with peers or fellow students regarding group work, collaboration with teachers for direction and guidance, and collaboration using social media with the peers and teachers via mobile devices. Details of the focus groups interviews including actual and verbatim quotations from students are presented in the following subsections.

4.2.1 Collaboration with Peers

Students from all backgrounds and universities found it very useful to be able to communicate and collaborate with peers using mobile devices; particularly when they were involved in a team project or group assignment. Collaboration with peers using mobile devices was discussed by most of the mobile learning research studies

in literature and is one of the main advantages of utilizing mobile devices in a learning context (Barker, Krull, and Mallinson 2005; Danaher, Gururajan, and Baig 2009; Filstad and Gottschalk 2010; Hwang et al. 2010).

Students stated that they lived far from one another, and therefore most of them were able to communicate and collaborate by using conference calls, SMS, MMS, voice calls and Skype in order to continue with their group work. Two students shared their collaboration experiences with their peers using mobile devices; comments included the following:

> *'Here, I share my personal experience. A group leader sets up a conference call to all group members and assigns the tasks to everyone regarding any project or assignment. If any group member is facing difficulty, he or she also shares this with everyone.' [Uni C - Student1]*

> *'We use MMS in this kind of situation. If we are writing a computer program and encounter any errors, we send that program to our teacher using MMS. The teacher responds with feedback. Often the errors are corrected or identified. At other times, we might make an .exe file of some program and send it to friends so that they may do their part in checking or writing the source code for that component. We are able to complete our assignments by collaborating in this way.' [Uni A - Student3]*

Similar to the students' experiences regarding collaboration with peers using mobile devices in Pakistani universities, Motiwalla (2007) and many other mobile learning researchers including (Cobcroft 2006; Hwang et al. 2010; Kukulska-Hulme and Shield 2008; Kurti, Spikol, and Milrad 2008; Kwon and Lee 2010; MacCallum 2008) also found that students' learning outcomes, in secondary education and higher education environments, improved as a result of using collaborative tools such as SMS, MMS and voice calls.

4.2.2 Collaboration with Teachers

Most participants shared their positive collaboration experiences with their teachers when working on projects, assignments and field work. They recounted how 'instant'

communication with teachers helped them to proceed when they were at a very critical stage of a project or when they were unable to continue because of certain problems. They mentioned that collaboration using mobile devices had assisted them to submit their work on time resulting in productive use of their own time and that of their teachers. One student stated:

> *'This happened to me several times, I discussed things with friends and when we were unsure of something, I just called the teachers and we were able to resolve the issue.' [Uni A - Student3]*

This collaboration occurred in particular when students were working away from the university on field work projects or assignments.

> *'It is beneficial for a student too. Sometimes you are at a place where there is no access to a computer, so you can just send an SMS to your teacher and they reply.' [Uni C - Student1]*

However, they were very clear about the extent to which they could collaborate with the teachers using mobile devices. They found collaboration with mobile devices helpful only when the nature of the problem or question was not too complex and did not require a detailed discussion.

> *'If the problem is small, then the teachers may be able to help immediately but they cannot solve bigger issues via a phone call or phone message.' [Uni C - Student2]*

> *'I agree with him. We often collaborate with our teachers and friends and get our problems solved to some extent.' [Uni C - Student3]*

The positive outcomes of collaboration between students and teachers have also been discussed in other mobile learning studies (Cobcroft and Bruns 2006; Cortez et al. 2005; Divitini, Haugalokken, and Norevik 2002; Hwang et al. 2010). However, in this study, some students mentioned that many teachers did not like communication via their mobile phones as this might encroach on their time outside of working hours. Some teachers preferred not to give their phone contact information to

students. One student pointed out that younger teachers tend to allow students to contact them and collaborate via mobile devices; older teachers do not have much faith in the technology or they are not well versed in the latest technologies themselves, so they do not encourage students to use these channels of communication and collaboration for teaching and learning purposes.

> *'Collaborating with teachers in this way can be a problem because teachers do not use these options much.' [Uni B - Student4]*

> *'Actually, this is popular among the younger generation mostly.' [Uni B - Student3]*

4.2.3 Collaboration using Social media via mobile devices

Another point emerged when a number of students mentioned that they frequently use social media forums available on mobile devices such as Facebook, Skype, Google talk, and Yahoo. Although, the majority of students were using the usual features available on common mobile devices such as SMS, MMS, Voice calls and internet browsing, some of them reported that it was quicker and more convenient for them to approach some teachers or peers using social media channels. They also reported that they were able to share larger amounts of information and learning resources using social media forums from mobile devices in addition to SMS and phone calls.

> *'We have a group on Facebook and on Yahoo too. We share books, assignments and other resources with members of these groups.' [Uni B - Student3]*

Using social media for learning has been very popular among university students for the last few years (Alistair 2009; Idrus and Ismail 2010; Kukulska-Hulme 2012); however, not many studies on mobile learning in developing countries have reported the use of social media for learning purposes on mobile devices other than Oliver (2008) who did a comparative mobile learning study of students in Australia, Ethiopia and Malaysia focusing on the use of the Web 2.0 application on mobile devices. Oliver reported highly positive trends of using social media on mobile

devices for learning purposes among Ethiopian students as compared with their Australian and Malaysian counterparts.

Not every student uses social media on mobile devices for learning purposes because social media channels are accessible on relatively expensive mobile devices. When faced with this situation, students normally use computers at home or on campus to access learning resources and information shared on Facebook or Yahoo groups, and to participate in class discussion forums with their peers and teachers.

4.2.4 Collaboration - Summary of Discussion and Findings

The following points summarize the discussion and findings from data analysis regarding collaboration:

- Students communicate and collaborate with each other frequently using mobile devices for learning purposes, especially for group work and field assignments.

- Students communicate and collaborate with their teachers on mobile devices when they require their support or guidance in certain situations; this helps them to progress in their projects and assignments without waiting for teachers' formal face-to-face contact hours.

- Younger teachers like to communicate and collaborate on mobile devices whereas some older teachers do not encourage the same as they might not be well equipped or well versed in the newer technology and applications.

- Some teachers do not like to be contacted by students outside of working hours.

- Students also use social media on mobile device to collaborate with peers and teachers. There are fewer studies and reports on the use of social media via mobile devices in developing countries. This is an area for future work and research.

4.3 Usability - Results and Discussion

During the student focus group sessions, it was found that some students were not aware of the concept of usability. They knew very little about usability of mobile devices; however, they experienced issues related to usability of mobile devices for learning without labelling these 'usability issues'. When it was explained that usability of mobile devices in the context of learning referred to the ease with which mobile devices could be used for learning purposes, they gave reasonable responses based on their individual experiences. However, there were mixed responses in terms of usability-related issues. Some of them were very happy and reported that they did not face any usability-related problems unless they were using a new device; these few students seemed to be very experienced users of smart phones.

> *'I did not encounter any problem related to usability. When I connect with GPRS, the download speed is slow. However, WiFi works well.' [Uni A - Student2]*

On the other hand, many students reported that they faced quite a lot of usability-related issues when they performed learning activities using mobile devices.

> *'I experience a little bit of discomfort when viewing something on my mobile device because its viewing area is limited and very narrow which makes scrolling difficult. Further, typing on a mobile device is very difficult because of the tiny keypad.' [Uni A - Student1]*

> *'I think using mobile internet is not quite as easy on every mobile device; for example, typing an SMS is OK, but using internet on small screen is not that easy.' [Uni A - Student13]*

> *'I agree with the other students that there are some features which are not available on mobile devices. For example, email attachment and downloading is a big issue. If file is in pdf format, you can open it because it creates problems in viewing.' [Uni C - Student6]*

> *'There is a concern relating to the ease of using the keypad of mobile devices, it takes more time to type even an email using the keypad. For mobile learning, mobile devices with good keypads should be used or we might be able to attach an external keyboard to those devices.' [Uni B - Student3]*

A number of usability-related issues mentioned by students in the focus groups were quite similar to those in the literature, including smaller screen size, rapid battery consumption, smaller memory and storage capabilities, difficulty of attaching large files, not being able to perform tasks requiring heavy processing, some tasks taking more time and more steps, smaller keypad and compromised mobile internet speed at times (Chen et al. 2010; Kiili 2002; Kukulska-Hulme 2005b; Uther 2002; Wei, Zhuo, and Zhang 2008).

Issues related to the usability of mobile devices for learning has been divided into the four main categories of user interface, battery capabilities, memory and storage as well as other usability issues; and these similar usability issues were also discussed by Churchill and Hedberg (2008).

While moderating the focus group sessions in three universities, it was observed that there were certain students who were technology enthusiasts (generally telecommunication engineering and computer science students) and appeared to have fewer problems using mobile devices for learning purposes. If they encountered problems, they generally found a solution on their own as they indicated during the focus group discussion:

> *'If one is concerned about memory, the majority of WiFi-enabled mobile devices allow external memory to be installed in order to enhance the memory capacity.' [Uni B - Student6]*

Usually, these technology-savvy students come from more privileged financial backgrounds and they could afford expensive smart phones enabling them to explore more features and experience better usability of mobile devices for general use and for mobile learning. Koole (2009) discussed user experience as a big factor in reference to the usability issues of mobile device when used for learning; viz. the more users are experienced, the less usability issues they would face. Enthusiastic

technology students were very experienced mobile device users and probably would not require much training. Despite a lack of experience, students from relatively underprivileged backgrounds were very excited about the idea of mobile learning. Oliver and Goerke (2008) also found similar enthusiasm among Ethiopian students regarding the use of mobile devices for learning.

In spite of their enthusiasm and motivation, many students reported a number of usability problems such as poor connectivity, low memory capacity, slow processing power and configuration issues. Similar usability issues were also reported by Economides and Grousopoulou (2009); it was observed that the students who were reporting usability problems did not possess modern smart phones themselves and found usability problems due to the older phones they were using. Generally, they were calling smart phones *WiFi Enabled mobile devices* which showed that many of them did not even have a mobile device capable of connecting to their freely available university-provided Wi-Fi and internet. Some students explicitly mentioned that they did not have a better device; that is why they preferred to carry out learning activities on the computer:

> *'There are some mobile devices like Blackberry which have a big screen and you can read easily, but on older mobile devices you have to scroll down to read longer paragraphs of text. In spite of all the features of smart phones, we cannot read as easily as we do using a desktop computer.' [Uni C - Student4]*

In addition, there are several other factors which impact on students' mobile device usability experiences for learning. These factors include the extent to which they are experienced users, the extent to which they can afford to pay for sophisticated mobile devices or high speed mobile internet, and how much technical support they receive inside or outside the university.

During the analysis of the reported usability issues, it was found that due to lack of awareness and appropriate training, some students tried to accomplish activities that were not meant to be done on mobile devices such as writing code for the website development, writing special characters in programming assignments or trying to

play games with heavy graphics. Students have reported these issues inaccurately as mobile device usability problems:

> *'I am currently working on a website development project. I don't have internet access at home; therefore, I do most of the research work on the mobile. However, if I have to download some template or view scripts in php or html, then it becomes difficult to read and understand on the mobile. Some mobiles don't support MS Office. If you have ppt slides to view, you cannot do that because you can only view pdf files.' [Uni C - Student5]*

> *'If I try to send the source code of a program to a friend, there are some characters which do not exist and therefore cannot be viewed on the mobile device.' [Uni A - Student9]*

> *'If I have to play games, some mobile devices do not support the graphics of a game.' [Uni A - Student13]*

In this case, awareness is required and the students might be trained and informed that mobile learning is not to replace computer usage in educational environments, particularly for practical courses such as computer programming or engineering.

4.3.1 Usability - Summary of Discussion and Findings

The following points are some of the outcomes as a result of the analysis of focus group discussion on 'Usability':

- Experienced users and technology enthusiasts had fewer usability problems.
- Students who already had smart phones reported fewer usability problems.
- Students who did not possess smart phones reported more usability problems which were due to the older technology phones they were using.
- Students from disadvantaged financial backgrounds were more excited about the idea of using mobile devices for learning.

- If all students are to be given similar smart mobile devices funded by the university they would reap the benefits of mobile learning.

- Students tried to accomplish practical and lengthy learning tasks or assignments on the mobile devices without appropriate training or guidance; and they perceived it as a mobile device usability issue when they found it difficult to complete the task.

- Students needed to be informed and trained appropriately for mobile learning readiness.

4.4 Context - Results and Discussion

Students did not know much about the meaning of the context with reference to mobile learning; however, when it was explained to them that mobile device could be used in different locations and environments to collect or work with contextual data such as displaying information of objects in museums on users' mobile devices and in field work to capture images or videos; they understood it well. They answered the questions about how mobile devices were used to learn across different contexts and locations when the questions were posed indirectly using other simpler terms and examples. They were quite excited that mobile devices proved very useful for gathering data at different places. They reported their own experiences of using mobile devices in certain contexts and how they benefited from mobile learning.

> *'Once we did a project on computer graphics, and we used our mobile device camera to take pictures for that project.' [Uni A - Student5]*

The use of mobile devices in a particular context is not new. Researchers have been experimenting with the idea of using mobile devices to collect data in a particular context such as the observation of birds by children on a farm and recording their observation on mobile devices (Chen et al. 2003; Santos et al. 2010; Song 2011; Thüs et al. 2012). Students in Pakistani universities also reported their experiences about using mobile devices for learning purposes when they were off campus for field work or engaged in data collection for a project or assignment. They talked

about using their mobile devices to record interviews with participants, take photos and record videos for the purpose of assignments or projects.

> *'We can take photos with the help of a mobile device.' [Uni C - Student1]*

> *'These photos can afterwards be used for some assignments.' [Uni C - Student2]*

> *'You can attach a reminder with photos and mention the purpose of usage.' [Uni C - Student1]*

Literature shows that mobile devices also have been used in context-sensitive environments and for location awareness such as identifying and learning about objects in museums and other non-academic settings where mobile devices can sense the object and display relevant information to the user (Bormida et al. 2002; Klopfer, Squire, and Jenkins 2002; Könönen et al. 2010; Proctor and Burton 2003a; Wishart and Triggs 2010). Students in the current research also have reported trying to use mobile devices to display context-sensitive information in one of their project exhibitions.

> *'It happens in our exhibitions of projects. Information related to a specific project is displayed on the mobile devices of audiences when they approach a certain object.' [Uni B - Student3]*

However, only a couple of students reported that they have used mobile devices for context sensitivity; the rest of the group was not aware of the concept of context sensitivity or location awareness with reference to mobile devices. For those who knew about this, it was a good experience. In general, the majority of participants did not use their mobile devices for any context-related activity at all. There could be two possible reasons for this: 1) they did not have a mobile device with supporting features; or 2) they had a mobile device without realizing that they could use it for such learning purposes. Many students admitted that they were not aware of the fact that a mobile device could be used so effectively in different contexts. They were excited about the idea and wanted to use it for collecting data and other information when doing field work in the future.

4.4.1 Context - Summary of Discussion and Findings

As an outcome of analysis of students' focus groups, a summary of findings regarding the use of mobile devices across different contexts and locations is as follows:

- In general, the majority of students were unaware of the concept of contextual use of mobile devices and of context sensitivity. However, some of them had experienced it without knowing it.

- Some of the students shared their experiences of using their mobile devices in different contexts.

- Students reported that they have used their mobile devices in different contexts for purposes such as taking photos, making videos during field work and recording interviews during data collection visits to different sites.

- A few students also reported that they have experimented with displaying context-sensitive information on mobile devices such as presenting information during their project exhibitions. Given that some students were unaware of the capabilities and features of the mobile devices which would add to their learning, the findings revealed that this could be a potential area for future work and research.

4.5 Blending - Results and Discussion

The students who participated in the focus groups expressed that they are currently blending traditional or face-to-face learning with mobile learning. They have practised it somewhat, they were excited about it, and they wanted it for the future as well. Mobile learning activities in which students were already engaged include checking their emails, participating in the class discussion boards, sharing information and files on Facebook and Yahoo groups, marking and checking their attendance, checking their semester results and sending SMSs to friends about campus activities or lecture schedules.

> *'I use eBooks the most. I download eBooks on my mobile device and read them whenever I can. Once, a teacher gave an assignment to write a review about a book. I did not get enough time to go to the library to get a book, so I downloaded an eBook on my mobile device and used that instead. I used my free time at the university to read and wrote a review about it. I also watch video tutorials on my mobile device using YouTube. Sometimes, I download the lectures of Indian lecturers from YouTube and learn from them. I also record lectures and listen to them later on. I take pictures instead of copying notes from my friends if I need to. I take notes on my mobile device and keep reminders for different events and activities. I chat, blog and Skype using my mobile device. I email my teachers and send them assignments. I use the dictionary on my mobile. I am currently learning Spanish, so I also installed a Spanish dictionary on my mobile device. I use the internet to do research for assignments and projects.' [Uni A - Student5]*

As shown in the response above, this student is using the mobile device effectively. Wan and Howard (2007) discussed similar learning activities that a learner can undertake using his mobile device in a blended learning environment. In Pakistani universities, some students were not aware of the fact that mobile learning can be part of blended learning and they mistakenly believed, and were concerned that, a mobile device could replace teachers. They also assumed that mobile learning could replace computers and laptops.

> *'I think that what a teacher can deliver cannot be achieved through a mobile learning mode. We can ask questions instantly when a teacher is present.' [Uni C - Student6]*

> *'I think all of these tasks could be better done on computers.' [Uni A - Student8]*

However, after they were told that mobile learning is intended to add options to the existing forms of learning, they were satisfied; they were open to accepting and embracing mobile learning in Pakistani university environments if it were offered in combination with face- to-face learning.

> *'For about 15 to 20 percent of the course, I think one must have access to mobile learning but one must use it correctly.' [Uni B - Student2]*

Students might be able to use their own mobile devices for several learning activities such as watching video lectures and looking up in dictionary, and administrative tasks such as viewing their enrolment information, checking exam results and attendance statistics. They were happy and willing to enrol in a course that offered a partial mobile learning mode.

> *'I would definitely prefer to enrol in a course offered in mobile learning mode as it will allow us to work while travelling or anywhere else. Yes, I agree with other students that the university should facilitate the students' engagement in mobile learning.' [Uni C - Student2]*

The analysis of all students' focus groups shows that blending mobile learning with existing forms of learning is the way to start introducing mobile learning in Pakistani university environments. Literature shows that researchers have tested mobile learning options for the learners in blended learning environments where learners - along with mobile learning - are able to access existing learning options such as face-to-face interaction with teachers, using online learning tools and attending classroom activities remotely (Gururajan et al. 2011; Pérez-Sanagustín et al. 2012; Shen, Wang, and Pan 2008; Wang et al. 2009).

4.5.1 Blending - Summary of Discussion and Findings

The following points summarize the students' discussion about blending mobile learning with existing learning forms in Pakistani universities:

- Students' experiences of mobile learning showed that they were actually mixing many forms of learning including face-to-face learning, e-learning and mobile learning. They talked about the activities and tasks they were currently performing using mobile devices for learning purposes. They were willing to embrace mobile learning only in a blended learning environment.

- Students discussed that mixing mobile learning with existing forms of learning may work as an introduction to mobile learning in the Pakistani university environments.

4.6 Control - Results and Discussion

The majority of participants misunderstood the question about control by the teacher; they assumed that mobile learning is supposed to replace the teacher with a mobile device.

> *'I think that what a teacher can deliver cannot be achieved through mobile learning mode. We can ask questions instantly when a teacher is present.' [Uni A - Student6]*

> *'Often, students do not do anything without the teacher's intervention.' [Uni C - Student4]*

It was explained clearly to them that mobile learning was not meant to replace the teacher with mobile devices. However, the latter requires students to be more independent learners as they will have to learn on their own while on the move or at work if they wish to be involved in mobile learning (Chen et al. 2004; Chen 2009; El-Bishouty et al. 2010; Wishart and Triggs 2010).

There were mixed responses to the question as to whether students would be able to learn independently and be responsible, independent learners without the teacher's intervention. Some students said that they needed the teacher's help all the time, while others reported that they engaged in learning activities by themselves independently of the teacher.

> *'It also depends on motivation level. For example, if I like mathematics, I will solve problems even if I have to work hard to find the solutions. For other courses, however, I would not work so hard. What I mean is, that if you have motivation for something, you can do it without a teacher's help or intervention'. [Uni A - Student11]*

> *'I agree with Student11. I think no human being is dumb or too smart; it just depends on how much effort you want to put in to achieve your goal. It does not depend on a specific teacher's help if somebody really wants to learn something. If you want to learn something, you will read more books, do intensive internet search even if you are using mobile internet to get instant and the latest updates. You will do whatever it takes to achieve your goal.' [Uni A - Student7]*

Some students mentioned that they learn better when the teacher is involved; they felt the guidance by the teacher and their own self-accountability led them to submit their assignments on time. Also, they needed assurance from the teachers to guide them on the right track. One student believed that everybody would engage in mobile learning if they had no other choice, while others were of the opinion that students would love to explore and try a new mode of learning such as mobile learning as it provided so many benefits. Another student mentioned that not every course or subject matter is so simple that it can be understood independently of the teacher or so complex that the teacher needs to be consulted constantly; therefore, mobile learning would be ideal for some courses and for other courses, it might only partially be successful. Also, a student's own interest level of experience and readiness are significant if the switch were made to mobile learning.

> *'It depends on the nature of the course and nature of the student himself. Some students pick up the concepts quickly but some students do not want to learn even if the teacher helps them out a lot.' [Uni A - Student3]*

Students also discussed that teachers should be involved in the design of mobile learning courses. One student suggested that mobile learning activities should be designed in such a way that students should find it very interesting and feel motivated to embrace it.

> *'Teachers should design some activities to help motivate the students to do their tasks.' [Uni C - Student5]*

The literature also complements the idea of teachers needing to be actively involved in the testing and implementation of mobile learning in the higher education sector.

Teachers also need to be motivated and appropriately trained to deliver mobile learning courses in a blended learning environment (Chen et al. 2010; Fernandez, Simo, and Sallan 2009; Jeffrey 2009; Wang and Ryu 2009).

One participant mentioned an important issue regarding students from different social and academic backgrounds. For instance, some students have graduated from private schools which mostly follow the American or Western style of schooling system which includes A-Levels and O-Levels (British Medical Association) where they are trained to be independent learners. However, the majority of students had come from a traditional or government school system where students are not encouraged to be independent learners. This underlying fact may impact significantly on the students' confidence in switching or adapting to a mobile learning mode where they are required to be independent or self-learners.

> *'Although I agree with all of them to some extent, I will mention something important. In our session, students are from a matriculation background in contrast to a few people from A-levels. A-level students are used to completing set tasks without having to be pushed by their teachers.' [Uni C - Student4]*

4.6.1 Control - Summary of Discussion and Findings

A summary of students' perceptions and expectations about the role of the teacher in a mobile learning environment is as follows:

- Some students were happy to learn independently if the subject matter was not too complex. Students would welcome the opportunity to be independent learners if they were given the option.

- They wanted a teacher to be involved in the process of their learning in the university environment whether a course is offered via face to face or in mobile learning mode; teachers' involvement may vary in reference to the mobile learning mode.

- Regarding their ability to be self-learners, many students were reluctant to be independent learners.

- Some of the students were from the public sector high school system where they were not expected to work independently of teachers, while some students came from private school systems where the teaching and learning style was more like that of developed countries and students were given tasks to do on their own. Their educational background impacted on their perceptions and expectations of teacher's role in the learning process in a mobile learning environment.

4.7 Connectivity - Results and Discussion

There were vibrant discussions on the topic on connectivity and network-related issues. The students stated that network connectivity is dependent on a number of factors such as the quality of mobile devices, the availability of Wi-Fi, the speed and cost of the internet. The students also revealed their weekly mobile internet usage. Most issues raised by students in relation to connectivity and mobile learning are consistent with the findings from other studies (Economides and Grousopoulou 2009; Goyette 2005; Kukulska-Hulme 2012). Cheon et al. (2012) have recommended that the slow speed of mobile internet and technical limitations of mobile devices should be acknowledged and considered carefully when designing mobile learning initiatives. The following subsections contain details of the topics discussed in relation to connectivity issues by the student focus group participants.

4.7.1 Mobile Internet Usage

On average, students used the mobile internet infrequently due to inadequate mobile internet access and speed. However, the majority of them used it in spite of its slowness. They mentioned that they used it because of its convenience for checking emails, browsing the internet and other necessary information while on the move; and these tasks did not demand a lot of processing or heavy downloading.

> *'It's general. During lectures or during discussions with somebody, I may come across new terminology. I can just check the meaning of that specific*

term instantly on my mobile. I use my mobile for about an hour each day.' [Uni B - Student3]

'I don't use it daily but during the week whenever I find time, I use internet via my mobile device. I browse the net if I have to search for some material for my assignment. I check my Yahoo, Hotmail and Google mail as well. Sometimes, I use Twitter too. Overall, I use mobile internet 12-24 hours per week.' [Uni C - Student6]

'I check email and Facebook and I also browse some informative websites regarding religion and current news.' [Uni B - Student4]

In spite of the slow speed of the mobile internet, the students' weekly usage indicates their level of interest in mobile learning without any intervention or training. Barker et al. (2005) and Oliver (2007) also have mentioned a similar enthusiasm by students for mobile learning in spite of limited resources in African countries including South Africa and Ethiopia; it indicates the feasibility of the possible future introduction of mobile learning in Pakistani university environments.

4.7.2 Mobile Internet and Wi-Fi

In all of the focus groups, the students stated that they would prefer using Wi-Fi on mobile devices as it has very good downloading speed; however, Wi-Fi cannot be used or relied upon as its availability is limited to certain remore and geographical areas and this included the university campus or at home. They liked the idea of being able to access learning resources and undertaking learning activities anywhere and at any time, yet most of the students mentioned that the speed of mobile internet was need of major improvement for something as serious as learning activities.

'I think it is easier to access and use WiFi and there are fewer problems in downloading if we are connected with WiFi. For example, if we have 1MB connection, you can download files easily. Or if you wish to do social networking or want to check emails, that is easier too. On the other hand, mobile internet is slower.' [Uni A - Student1]

In Pakistan, mobile and cellular technologies such as General Pack Radio Service (GPRS) and Enhanced Data Rates for GSM Evolution (EDGE) are being used by telecom providers which usually result in slow speed mobile internet as compared to 3G mobile technologies which were not available in Pakistan at the time these focus group sessions were conducted.. There were some controversial political issues regarding the launching or issuing of 3G licenses in Pakistan; however, media reports suggested that it would be available in the near future (PTA 2013). With the availability of 3G technologies, university students will have the advantage of being able to engage in mobile learning activities with a faster and more efficient mobile internet.

Although students reported that mobile internet is slow, costly for them, and did not work well on every student's mobile device, it still provided them with the flexibility to communicate and collaborate with their peers and teachers remotely. On the other hand, Wi-Fi is very cheap and provides very good speed but is available only in particular areas. This may be good to access learning resources through mobile device around campus or other Wi-Fi-enabled areas but students cannot access learning resources anywhere and at any time. Ultimately, they wanted both a high speed mobile internet and Wi-Fi in order to engage in mobile learning in Pakistani university environments.

> *'If we're provided with 3G technologies and Wi-Fi, then we can do many of these activities. We cannot do many of these activities with the available technologies in Pakistan.' [Uni C - Stuent2]*

They discussed that, for the past couple of years, the government telecommunication department has been arranging internet providers to provide cheaper DSL packages for students. They wanted similar arrangements from the government and universities for mobile internet and Wi-Fi availability for mobile learners.

> *'A Pakistani Telecommunication Company has introduced cheap DSL internet packages for the students apart from the general public.' [Uni C - Student2]*

'I was going to mention the same point. This facility should be provided to the students by the university. If mobile companies are charging expensive rates for internet packages, the university should negotiate with them so that they introduce cheap packages for students, and students should be given access outside the university as well.' [Uni C - Student4]

4.7.3 Mobile Devices for Learning

Students had repeatedly stated that many of their fellow students did not own smart phones or Wi-Fi-enabled phones; therefore, they were unable to take advantage of mobile internet or Wi-Fi. This ultimately hampered their ability to access learning resources remotely or while on the move.

'Wi-Fi-enabled mobile devices usually have enough memory to save files. Mobile devices with lesser capabilities have concerns related to memory but those are not Wi-Fi-enabled. GPRS technology can be used in these non-WiFi-enabled mobiles but you may not be able to download large files using GPRS.' [Uni B - Student6]

They considered this to be a major factor or hindrance to the possible future introduction or implementation of mobile learning in Pakistani university environments. Further, a mobile device with advanced processing capabilities would allow them to perform learning tasks quickly.

'I prefer to use mobile internet when I am out of home but it has slower speed. Also, it depends upon the quality of the handset, the model and its downloading capacity.' [Uni A - Student6]

'Different telecom providers allow different speeds for mobile internet. It also depends upon the quality of the handset. For example, downloading is far better when you are using a pocket PC or tablets compared to an ordinary mobile device.' [Uni B-Student3]

If mobile learning is to be introduced in Pakistani university environments, students expect that all students should be given, or assisted by the universities to purchase, the same sophisticated mobile devices.

> *'If we have to use mobile devices for learning, the university should provide us with these devices or assist students to buy Wi-Fi-enabled mobile devices.' [Uni B - Student8]*

They also suggested a number of solutions in order to resolve issues regarding mobile devices for learning; for instance, the university could issue them an interest-free loan, to be paid back in instalments, to buy smart mobile devices for learning purposes.

> *'Some universities in Pakistan are providing laptops to the students at very affordable rates with the collaboration of some of the bigger computer giants like DELL. Students are paying them in instalments. If students can be supported in getting laptops, then they can also be supported in getting mobile devices. Mobile devices are far cheaper than the laptops and every student can afford one.' [Uni C - Student1]*

They talked about other options such as using students' own mobile devices after a successful test implementation of mobile learning. One student suggested that the university should lend students mobile devices for a certain period or semester; then the mobile devices could be returned and re-used by other, future students. Students also suggested that mobile devices for learning could be designed differently, focusing on performing learning activities along with communication features.

> *'After a trial period, students' own mobile devices can also be used for mobile learning by imposing some restrictions on them. Frequently used learning software should be available for students to download and install but installing other unnecessary software should be restricted. Students may seek the permission of the university administrator before installing restricted apps.' [Uni B - Student5]*

'It is also possible that mobile devices may be the property of the university, designed exclusively for students. Students may be issued with these devices for use and return them to the university when they are no longer required.' [Uni B - Student7]

'Ideally, a mobile device for learning purposes should be designed.' [Uni B - Student1]

4.7.4 Connectivity - Summary of Discussion and Findings

The following is a summary of students' discussion about connectivity and network related issues which may impact their involvement in mobile learning greatly:

- Students mentioned a number of issues associated with the topic of connectivity such as unavailability of Wi-Fi enabled mobile devices to all students, slow speed of mobile internet and limited access to Wi-Fi networks.

- Students reported that they are using mobile internet for approximately 4 to 6 hours weekly on average. They were using it most of the time for social networking, browsing the internet and checking emails.

- In spite of slow speed of mobile internet and other connectivity issues, students were excited to be involved in mobile learning in Pakistani university environments.

- Students demanded that the university provide them with smart phones for learning or assist them to buy their own devices to be used for learning purposes.

- Speed of mobile internet may be improved subject to the launch of 3G cellular technology in Pakistan in the near future.

- A mobile device for learning may be designed by mobile companies.

- Students expected both high speed mobile internet and Wi-Fi in order to engage in mobile learning in Pakistani university environments.

4.8 Flexibility - Results and Discussion

Flexibility was considered one of the biggest advantages for students using their mobile devices for learning. However, flexibility is an umbrella term that includes mobility, portability of mobile devices and convenient access to learning resources; similar terminologies have also been used in the literature (Koole 2009; Kukulska-Hulme and Traxler 2005; Naismith et al. 2004b).

> *'It will be a lot easier for a learner as he can do learning activities from anywhere and at any time; everybody owns a mobile device these days. It will save time as a mobile device is always on, we are able to work instantly; on the other hand, we have to turn our PC on if we have to perform even a small task.' [Uni A - Student1]*

In reference to mobile learning, Sharples et al. (2002) argue that the mobility is closely related to the concept of learning; learning does not have to occur only when the learner is stationary. Pachler et al. (2012) also discuss that mobile learning may include learning in the personal spaces of learners, unlike the notion of learning at a fixed location such as school or on university premises. Similarly, students in Pakistani universities were very excited when talking about the flexibility that a mobile device might add to their learning. They discussed the advantages of time saving, convenience of accessing learning resources, quick completion of minor tasks benefitting from the *always-ON* feature of mobile devices, using a mobile device as a laptop modem to perform learning tasks if the internet was not working, using their mobile devices while travelling on public transport to and from university and during their free time on campus. A number of students from all student focus groups reported that they had used their mobile device to find meaning or to understand a concept instantly using online search or dictionary.

> *'Sometimes, we forget something, some concept; we check that instantly via mobile devices and you feel comfortable with that immediate access.' [Uni B - Student1]*

They also expected that the university would contact them using mobile technology such as sending SMS reminders for administrative purposes such as enrolment deadlines or fees.

> *'It would be handy if the university could send necessary information regarding enrolment and fees to students' mobile devices.' [Uni C - Student4]*

Another student talked about the portability of mobile devices and said that it was easier to carry mobile devices compared to a laptop while on the move, even around the campus.

> *'On the other hand, being connected to Skype through your mobile is a relaxation; you can move around at least within a certain range; if you are using a PC, you have to stick to it.' [Uni C - Student3]*

Similar mobile learning flexibility-related experiences have been discussed by the participants of other mobile learning studies (Brown 2009; Chao and Chen 2009; Kukulska-Hulme 2010; Kukulska-Hulme and Traxler 2005; Petrova 2010; Schneider, Bleimann, and Stengel 2009; Wang and Ryu 2009). There were some concerns among the students about whether or not they would be able to benefit from the mobility and flexibility of mobile devices. For instance, the students mentioned that downloading material or accessing learning resources at a good speed was possible only when they used Wi-Fi; however, the problem with Wi-Fi was the restriction to certain geographical areas; and they did not consider it a flexible option as they could also use PCs at the university or a laptop on campus if they had to be within the Wi-Fi range. They mentioned that usually students have mobile internet available on their mobile devices using GPRS technology which did not give them very good speed to access learning resources or do mobile learning activities when they were out of Wi-Fi range or on-the-go outside of the university premises. This unavailability of a high speed mobile internet compromised the flexibility that mobile devices were intended to add to their learning.

> *'In this case, you may not face area restriction of WiFi but using GPRS technology will decrease download speed considerably, resulting in wastage*

of time compared to WiFi, which enables you download at a higher speed.' [Uni C - Student4]

'In the area area where WiFi is available, 90% of computers and laptops are also available to connect to that WiFi and use internet. We may choose to download using those computers and laptops in that WiFi area.' [Uni B - Student5]

On the other hand, some students reported that they were happy about being able to connect and access learning resources to some extent even with the slow mobile internet.

'I use my mobile device in preference to a laptop because I may not be able to connect my laptop with GPRS technology if I am in a place where there is no WiFi coverage. With my mobile device, I have an option. I can connect through cellular technology if there is no WiFi available.' [Uni B -Student4]

To benefit from the flexibility and mobility of mobile devices for learning purposes, a few students mentioned that the mobile devices could also be used very effectively to educate people who are not university students; e.g., adult or illiterate people wanting to learn while they are at work or at home. This is another direction where mobile learning could really open the avenues for the underserved population of developing countries; this can be done if the governments, NGOs and telecom providers participate in mobile learning initiatives. In Pakistan currently, such an initiative is being taken by UNESCO and NOKIA jointly to train school teachers to use the mobile learning mode (Steve 2012; UNESCO 2013b). Also, in 2010, Mobilink (a telecom company in Pakistan) helped hundreds of school girls learn via mobile devices (UNESCO 2010). A few NGOs such as Aagahi and Bunyad are engaged in mobile learning initiatives with the sponsorship of telecom companies to spread literacy among underserved rural people, children and women (UNESCO 2013b).

4.8.1 Flexibility - Summary of Discussion and Findings

Findings from the analysis of students' focus groups about theme of Flexibility of mobile learning are as follows:

- Generally, the majority of students in all of the focus groups had experienced some level of flexibility that a mobile device adds to learning.

- They shared their experiences and were very enthusiastic about using mobile devices to access learning resources regardless of their location.

- Students also showed concerns about the slow speed of mobile internet which prevented certain mobile learning tasks from being performed. They also stated that there were several high speed mobile internet packages or plans but these were too costly for them to buy.

- Students said that they could use Wi-Fi only for downloading learning material because of the slow speed of mobile internet. However, Wi-Fi constrains them to be in certain places; therefore, the true potential of mobile learning may be compromised for them.

- Students also suggested that mobile learning could be used to educate illiterate young and adult people in the community, particularly those who work full time and are unable to attend schools or universities, or who are underserved and rural populations. This is a potential area for future work and research.

4.9 Technical Support-Results and Discussion

The majority of participants reported that they did not need much technical support in resolving minor issues with their mobile devices other than a few issues such as configuring a new device with settings, establishing a mobile internet connection, establishing a Wi-Fi connection or when a mobile device has a major repair issue. They resolved day-to-day issues themselves or discussed these with their family and friends who had similar devices and may have encountered similar problems. They preferred to discuss issues with friends before they made a call to a telecom service

provider company's customer care department or contacted the university's IT support team. The following discussion, from the transcript of University B's student focus group, demonstrates the students' thoughts about seeking technical support.

> *'I face problems when I have to activate my mobile internet. When this happens, I ask someone for technical assistance. Once it is activated, I can then handle things myself.' [Uni B - Student1]*

> *'I think I usually need help when I try to establish connection with WiFi because I have to change several settings on my mobile device, I find it difficult to do that myself. For GPRS, I don't face any difficulty doing this myself if I know the details of the package I am going to activate.' [Uni B - Student2]*

The students indicated that they did not require a lot of technical support to formally switch to mobile learning. However, this is contrary to reports in the literature. In some mobile learning studies, such as Traxler and Kukulska-Hulme (2005), it has been argued that technical and IT support is necessary in order to launch mobile learning in developing countries. A number of other mobile learning researchers drew similar conclusions about the provision of technical support for mobile learners if formal mobile learning were introduced into mainstream education (Koole 2009; Motiwalla 2007; Traxler 2009; UNESCO 2005). On the other hand, some mobile learning researchers also found that there is minimal need of technical support; Naismith and Paul (2009) reported little technical support was needed in running their pilot project in museum settings. Sife et al. (2007) concluded, in relation to mobile learning in Tanzania, students in developing countries become self-sufficient in technical support for minor issues because formal technical support services are unavailable. Furthermore, it can be argued that people are becoming more and more technology savvy as time passes, therefore requiring less technical support.

In a mobile learning setting, the need for technical support for teachers and researchers implementing or testing mobile learning projects is inevitable. These aspects of technical support will be discussed in more detail in relevant chapters with reference to teachers and administrative stakeholders.

The collective discussion dealing with collaboration, flexibility, usability and mobile learning activities shows that students in Pakistani universities habitually download material, watch online videos, read eBooks and search using their mobile devices. This implies that they would not need much help or technical assistance if mobile learning were to be implemented formally in the university environments in the future. Perhaps only a few introductory training sessions is required to orientate the students to the particular test environment for a mobile learning initiative.

4.9.1 Technical Support - Summary of Discussion and Findings

The following points summarize the students' perceptions about the need for technical support during their engagement in mobile learning activities:

- The majority of the students did not have many problems when using their mobile devices or browsing mobile internet for day-to-day matters; this would eventually help them switch to and adapt to mobile learning in the future.

- There were some particular issues where they certainly needed technical support from telecom providers or university IT helpdesk team such as for the configuration of new device settings or network settings.

- Students download audio/video files for personal use and social networking purposes; this made them familiar with mobile internet and Wi-Fi networks. Ultimately, it means that they will require less technical support for mobile learning.

4.10 Mobile Learning Activities and Applications - Results and Discussion

For the mobile learning activities and applications topic, students were excited and shared their experiences of the many applications and activities they were using informally. During the data analysis from the students' focus groups from three Pakistani universities, it was found that students have been engaging in a range of

mobile learning activities and applications. Firstly, Nvivo Software text based search was used to identify the mobile learning activities and applications discussed students. Results of Nvivo text based search, however, did not choose all the cases where participants did not name an activity directly rather mentioned in a different meaning. For instance in the comment below, the student did not use the term collaboration explicitly, Nvivo text based auto search have not selected it for the case of collaborative activities.

> *'Sometimes, I call teachers to discuss problems related to assignments.' [Uni A – Student9]*

Therefore, text all of the transcripts were read, selected and coded manually in NVivo for the mobile learning activities and applications experienced by students in Pakistani universities. Out of that analysis process, four categories of mobile learning activities and applications emerged from the data. These four categories were named as administrative activities, collaborative activities, informal learning activities and learning support activities.

It is important to mention that these results are based on a small sample and may not represent the trends for wider student cohorts in Pakistani universities. As this is ground-breaking research in this particular area in Pakistan, therefore, these results are important to demonstrate the existing mobile learning practices in Pakistani universities. These results could also be used by future researchers as baseline to plan and conduct a larger study about popular mobile learning activities among Pakistani university students.

4.10. 1 Administrative Activities

Activities such as connecting with Universities' Learning Management Systems using mobile devices to view exam results or attendance status, checking emails regularly and use of SMS to circulate lecture rescheduling information among students were categorized as administrative activities. Figure 19 shows the students' experiences related to administrative activities.

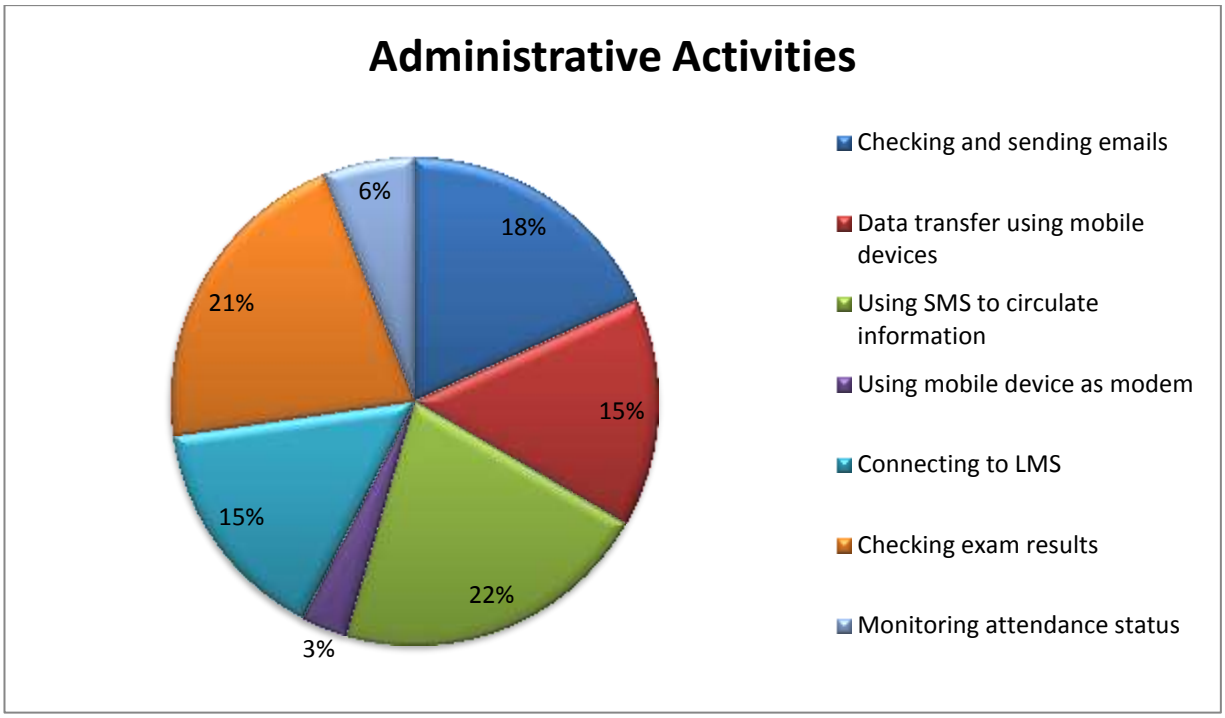


Figure 19: Administrative activities performed by students using their mobile devices

For the administrative activities, using SMS to circulate information and checking exam results using mobile devices were found to be most popular among the students. Checking and sending emails and using a mobile device as a data transfer mediium were other moderately popular activities among the students.

4.10. 2 Collaborative Activities

Collaborative activities was the second category emerged out of data analysis; this category includes activities such as collaboration with peers and teachers for assignments and projects, using social media on mobile devices to involve in learning activities and file sharing. Figure 20 shows the percentages of students using collaborative activities for mobile learning.

Using social media forums such as Facebook and Yahoo groups were mentioned by the students, were found to be most popular activity within the students whereas collaboration with peers and teaching for assignments and project was the activity many of students have been engaged.

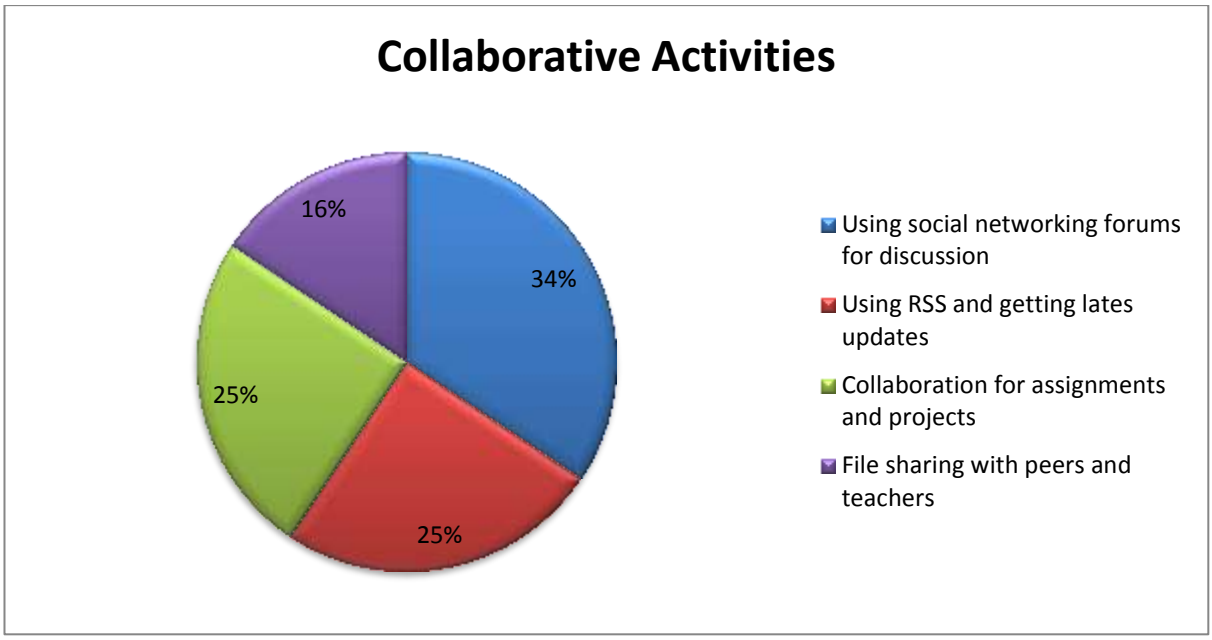


Figure 20: Collaborative activities performed by students using their mobile devices

However, file sharing with peers and teachers became less popular because of the attachment issues particularly files containing large amounts of data or images were found problematic for many students. Slow mobile internet speed might be another factor for the less number of students sharing files using mobile devices.

4.10. 3 Informal Learning Activities

The third category is informal learning activities such as creating documents, reading eBooks, note taking during lectures, listening to the recorded lectures and others.

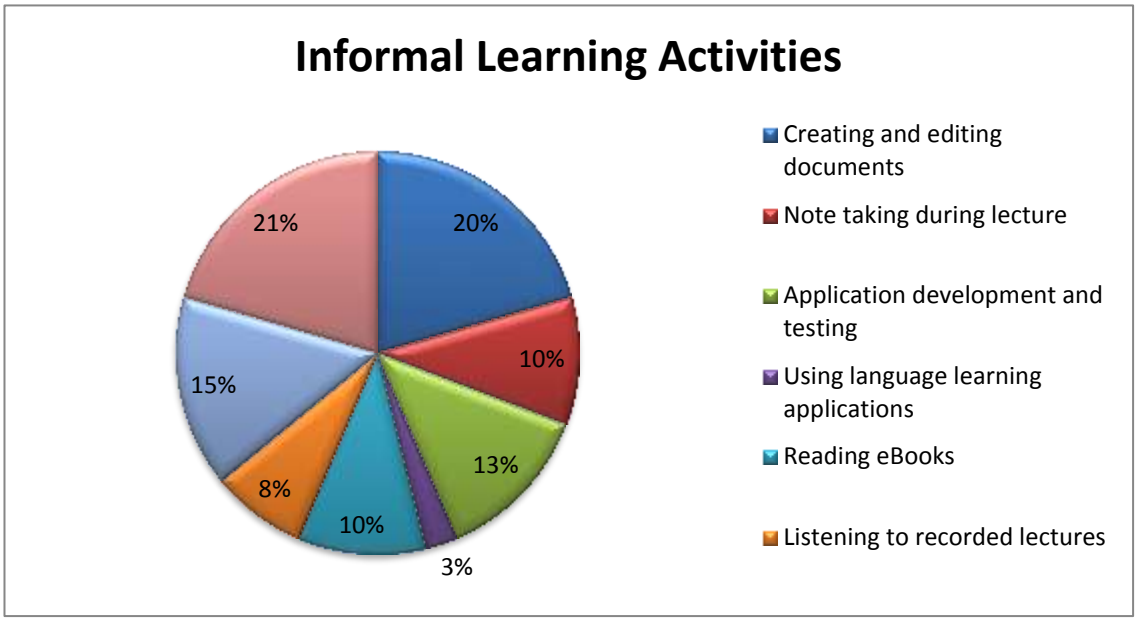


Figure 21: Informal learning activities performed by students using their mobile devices

Figure 21 shows the number of students involving in informal learning activities in Pakistani universities.

4.10. 3 Learning Support Activities

Fourth category was named as learning support activities. This included important and supporting activities such as accessing online library, downloading and reading eBooks on mobile device. Similarly, using camera during fieldwork assists data collection activities. Figure 22 shows the learning support activities performed by students as outcomes of data analysis for the students' focus groups.

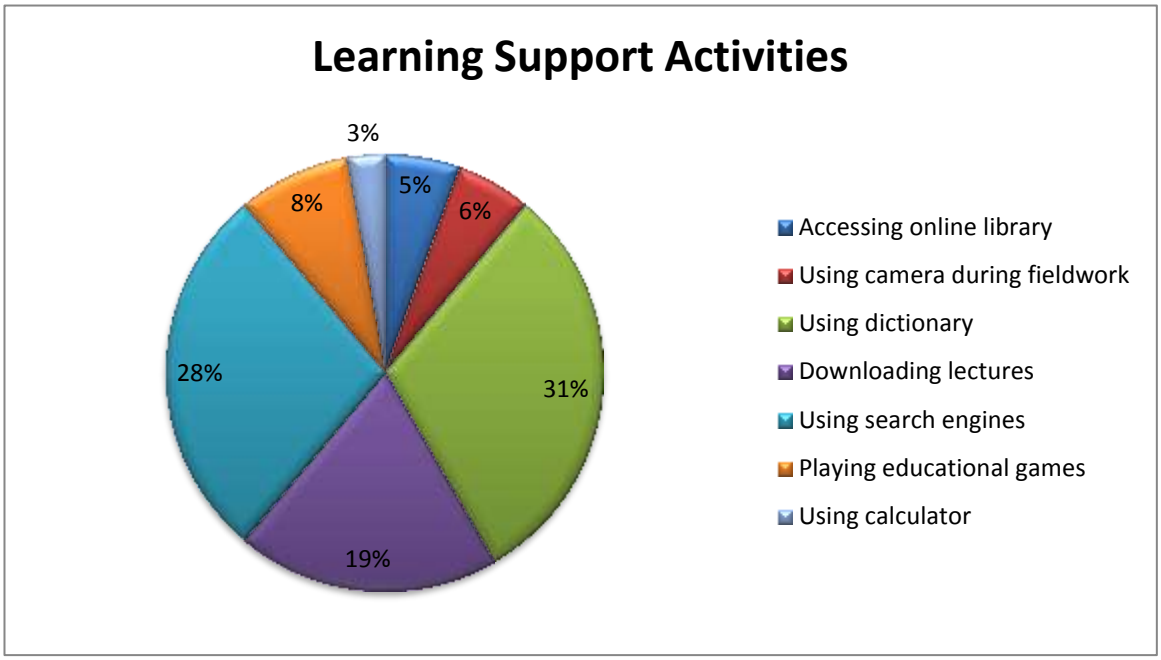


Figure 22: Informal learning activities performed by students using their mobile devices

Using dictionary and accessing online library were among the most popular activities in this category. The reason behind this popularity might be that the accessing online library is a good source for support especially in assignment preparation. In terms of accessing online dictionary, there exist a number of apps which is easy to install or access from a range of mobile devices. Some of the less advanced mobile devices also have built in dictionary application therefore a vast majority of university students were able to use dictionary.

4.10.4 Mobile Learning Activities by Students –Overall Summary

Overall, the informal learning activities were the most popular activities among the students participating in this research. As shown in Figure 23, 28% of the participants experienced the engagement in informal learning activities. Learning support activities is popularamong 26% of the participants. Administrative activities (such as checking of final grades, course details, etc) and collaborative activities (such as communicating with peers and teachers during assignment, projects and fieldwork) have been performed by 23% of the participants of this research.

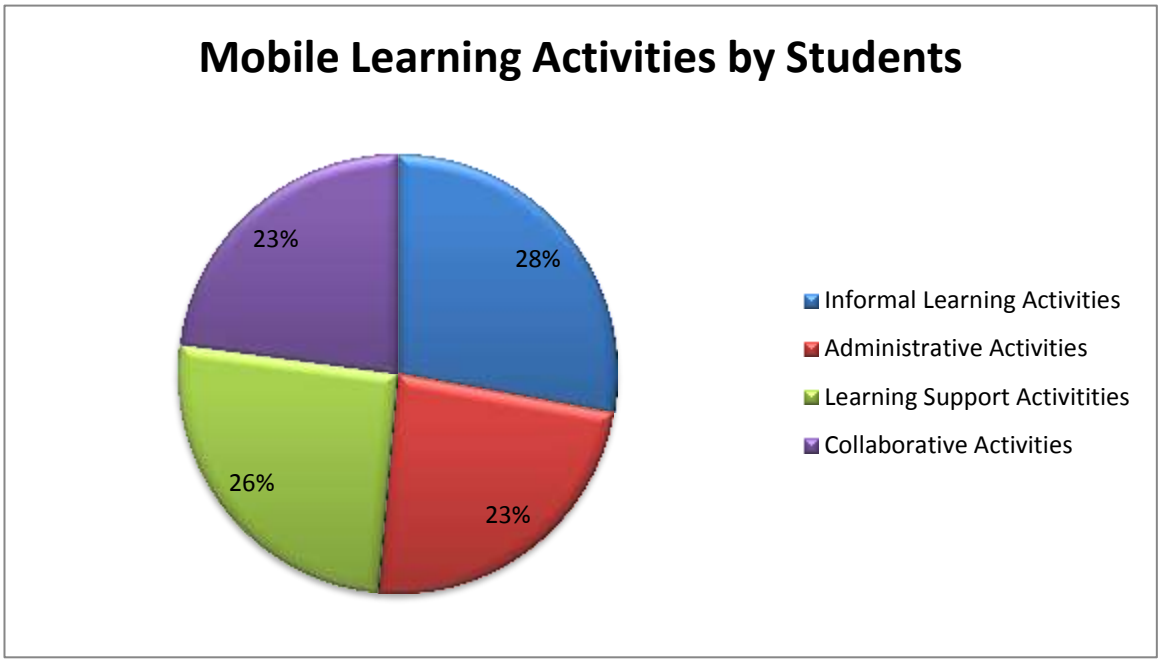


Figure 23: Category wise distribution of mobile learning activities performed by students using their mobile devices

Mobile learning activities and applications reported by Pakistani university students correspond to the extant mobile learning literature. For example, the categories of mobile learning activities framed in this research correspond to the categories of mobile learning activities by Naismith et al. (2004b) and Traxler (2009) as discussed in Section 2.4 of Chapter 2.

Table 8: Mapping of categories of mobile learning activities from this research with the themes by Naismith et al. (2004b) (Adapted from: Naismith et al. (2004b, 18)

Theme	**Key Theorists**	**Activities**	***Categories of Mobile Learning Activities from this research***
Behaviourist Learning	(Skinner 1968; Pavlov 1927)	Drill and feedback classroom response systems	*Collaborative Learning Activities* *Informal Learning Activities*
Constructivist learning	(Bruner 1966; Papert 1980; Piaget 1929)	Participatory simulations	*Collaborative Learning Activities*
Situated learning	(Brown, Collins, and Duguid 1989; Lave and Wenger 1991)	Problem and case-based learning context awareness	*Informal Learning Activities*
Collaborative learning	(Vygotsky 1978)	Mobile computer-supported collaborative learning (MCSCL)	*Collaborative Learning Activities*
Informal and lifelong learning	(Eraut 2000)	Supporting intentional and accidental learning episodes	*Informal Learning Activities*
Learning and teaching support	n/a	Personal organization support for administrative duties (eg attendance)	*Learning Support Activities, Administrative Activities*

The categories of mobile learning activities and applications experienced by Pakistani university students are mapped (see Table 8, Fourth Column in Italicized text) with the key learning theories and activities discussed by Naismith et al. (2004, 18) (see Table 8, First three columns, non-Italicized text). In addition, almost all of the activities and applications experienced and shared by the participants of this research have also been reported by other mobile learning researchers in mobile learning literature (Akhshabi, Khalatbari, and Akhshabi 2011; Becta 2008; Deng et al. 2005; Eschenbrenner and Nah 2007; Green, amp, and Hannon 2007; Kukulska-Hulme 2010; Kurti, Spikol, and Milrad 2008; Lan and Sie 2010; Ogata et al. 2008; Wang et al. 2009). However, the categorization of mobile learning activities and

application in this study was informed by the data collected from Pakistani universities' environments and thus a unique contribution of this research into mobile learning literature.

Other than sharing their mobile learning experiences, the students also revealed their expectations in the case of future implementation of mobile learning in Pakistani university environments with reference to the mobile learning activities and applications. The following comments show students' perceptions and expectations of mobile learning implementation in Pakistani university environments:

> *'Training in the use of software apps should be provided to the students before the start of a new semester so that they can save or install these in their mobile devices.' [Uni B - Student7]*

> *'All required software apps and lectures should be available in a shared space by the university so that students can access that shared space using their mobile devices.' [Uni B - Student1]*

> *'Mobile learning mode is better for the theory-based courses.' [Uni A - Student6]*

4.10.5 Mobile learning Activities and Applications - Summary of Discussion and Findings

Students' experiences of engaging in mobile learning activities and using mobile learning applications have been summarised in following bullet points:

- Mobile learning activities and applications discussed by students participating in focus groups were categorized into four main categories such as administrative activities, collaborative activities, informal learning activities and learning support activities.

- Mobile learning activities and application used by Pakistani students corresponded to mobile learning activities categorized by Naismith et al. (2004b)

such as behaviourist, constructivist, situated, collaborative, informal and lifelong learning.

- Mobile learning activities and applications experienced by Pakistani students were similar to those reported in the literature.

- Some mobile learning activities and applications such as informal learning activities and learning support activities were more popular among Pakistani students.

- Students also reported their expectations of universities if mobile learning were to be introduced formally in Pakistani university environments; these expectations include provision and installation of learning apps before the start of the semester and mobile learning to be included first in theory-based courses.

4.11 Cost - Results and Discussion

The majority of the students were very much concerned about the potential costs associated with mobile learning. As discussed by students in the focus groups, these costs include: 1) cost of mobile devices with advanced features, and 2) cost of using mobile internet. The following subsections contain a detailed discussion of these two main cost issues as pointed out by students.

4.11.1 Cost of Mobile Devices with Advanced Features

The cost of smart phones or sophisticated mobile devices was the biggest concern of students in Pakistani university environments who participated in the research. They knew that if they needed to switch to mobile learning, they would require mobile devices with relatively advanced features such as the capability of being connected to Wi-Fi which they thought would very expensive for them.

> *'I wanted to mention that a good WiFi-enabled set costs more than just 5 to 6 thousand rupees even if you buy its booster with it.' [Uni B - Student3]*

They also mentioned that some of the students already have smart and advanced mobile devices such as tablet PCs, PDAs, iPhones and Blackberries as they belong to rich families and can afford expensive phones and devices; in this case, the other students would feel disadvantaged and might not be able to perform similar mobile learning activities.

> *'I have a concern that not everyone can afford a costly mobile device; some people may feel bad if they cannot afford costly mobile devices.' [Uni A - Student8]*

A few students suggested a solution for this issue: the university could support students in buying mobile devices for mobile learning by providing a subsidy or short-term, interest-free loans.

> *'Some universities in Pakistan are providing laptops to the students at very affordable rates with the collaboration of some of the computer company giants like DELL. Students are paying them in instalments. If students can be supported in getting laptops then they can also be supported in getting mobile devices. Mobile devices are far cheaper than the laptops and every student can afford one.' [Uni C - Student1]*

> *'Universities should offer loans without interest which would be more beneficial for students.' [Uni B - Student4]*

> *'They don't offer such loans. They offer loans with some interest even for laptop schemes.' [Uni B - Student6]*

Some students did not see the need to buy expensive mobile devices just to use for mobile learning when they could buy a laptop for the same price which a student could use for many purposes.

> *'I want to ask something here. A good quality new Wi-Fi-enabled handset costs us a minimum of around 20 thousand rupees, whereas a laptop also costs around 19 thousand rupees and works best for university student. Why*

do we have to buy a mobile device when a laptop is cheaper?' [Uni B - Student5]

A number of students were concerned about the cost of advanced mobile devices; however, some students stated that they could buy second hand or used mobile devices which would be affordable and cheap. Another student suggested buying smart phones made in China as a cheaper option.

'I want to mention another option. Handsets from China are also of good quality and three times cheaper than the original ones.' [Uni C - Student6]

'The mobile device you buy for around 25 thousand will be available for approximately 10 thousand rupees if you choose to buy a Chinese handset.' [Uni B - Student4]

Many students assumed that mobile learning might require them to bring their own device; however, some students suggested that the university should give them mobile devices if the university wanted to encourage mobile learning. Lundin et al. (2010) suggested that universities should make efforts to integrate and use students' own mobile devices for mobile learning.

4.11.2 Cost of Using Mobile Internet

Students had different opinions about the cost of using the mobile internet for mobile learning purposes. Some of them stated that it was very expensive to use the mobile internet on a regular basis and they have to pay a lot of money out of their own pocket. Also, monthly mobile internet plans or packages are expensive and provide very low or compromised speed.

'The better the package in terms of download speed and efficiency, the more you have to pay.' [Uni C - Student3]

'The cost of a suitable mobile internet package depends on a student's usage and needs. If a student uses it frequently during the day for short intervals,

> *he can sign up for a package with a low connectivity cost.' [Uni A - Student7]*

They also discussed that in areas with poor cellular signals the mobile internet became disconnected very frequently resulting in more flag-fall charges for them to reconnect each time.

> *'Actually, GPRS doesn't cost much if you keep it connected unless it is disconnected and you have to reconnect. Establishing a connection again incurs cost. Also, if you download something even if it is a polyphonic ringtone, it costs you a lot. Let me share my experience with you. A few days ago, I downloaded a polyphonic ring tone and it cost me 28 rupees just for that.' [Uni B - Student7]*

As mobile learning activities may require frequent downloading and uploading of materials (Dyson et al. 2009), students mentioned that they did not have good downloading speed on low-cost or cheaper packages. Also, the technology being used was GPRS or EDGE which did not provide as ideal or optimum mobile internet speed as of 3Gs:

> *'Secondly, we face a problem when downloading. If we download something on our mobile device using GPRS technology, it costs a lot. For example, if we download some software application on a mobile, it is usually large.' [Uni B - Student4]*

While some participants had different opinions, they thought a mobile internet package with reasonable speed is not that expensive. Most students could afford those packages out of their own pocket.

> *'I think it costs approximately 500 rupees per month and that is not too much.' [Uni A - Student6]*

However, other than a few students who seemed to be well-off financially, the majority of students had issues with, and concerns about, the cost of the mobile

internet which they might have to pay for if they were involved in formal mobile learning activities.

Extant literature confirms students' thoughts and concerns about the costs of mobile devices and the cost of mobile internet. Dyson et al. (2009) includes these costs in overall mobile learning initiative costs for stakeholders. Scornavacca et al. (2009) particularly mentioned that mobile usage or mobile internet usage charges are very high and unaffordable by students in many countries. Economides and Grousopoulou (2009) conducted a study in a European country which revealed that students are willing to pay extra for mobile devices with advanced features. However, in a developing country such as Pakistan, results of this study show that not every student can afford an expensive mobile device for learning purposes. In spite of cost concerns, mobile learning is cost-effective in many ways for a developing nation such as Pakistan in terms of saving on building up computer laboratories in schools and universities, providing learning facilities to remote areas and eradicating illiteracy in underserved and female populations in rural areas (Kumar et al. 2010; Motlik 2008; Sari and Tedjasaputra 2008; UNESCO 2013b).

4.11.3 Cost - Summary of Discussion and Findings

Students' concerns about cost of mobile learning are summarised as follows:

- Students mentioned two types of cost associated with the possible implementation of mobile learning in Pakistani university environments: cost of advanced mobile devices and cost of mobile internet.

- The majority of students said that it would be difficult for them to afford these costs out of their own pocket.

- They expected the university to cover or subsidize these costs if mobile learning were offered to students. Some universities in developed countries provide their students with a mobile learning device and there could be some lessons to be learned from this practice. There are also practices (BYOD – Bring your own Device) where students bring their own devices as a learning tool.

- Some students were happy to buy expensive mobile devices or they already owned them. They were also willing to pay for mobile internet. These students usually belong to rich families where money is not an issue. They were already using mobile learning to some extent because they had advanced mobile devices and were experienced users.

- In spite of cost concerns, mobile learning is cost-effective in many ways for a developing nation such as Pakistan by saving on building up computer laboratories in schools and universities, providing learning facilities to remote areas and eradicating illiteracy in underserved and female populations in rural areas.

4.12 Socio-Cultural Factors – Results and Discussion

Students participating in focus groups were invited to comment on their perceptions and expectations about the implementation of mobile learning in the future. They expressed both expectations and concerns. Outcomes of the analysis of students' perceptions and expectations of mobile learning in Pakistani universities revealed that many of their perceptions and experiences represent a number of factors related to the social, economic and cultural aspects of society of a developing nation. A number of these observations have been discussed in many of the earlier sections of this chapter such as control, connectivity, cost and mobile learning activities and applications.

Two main factors could be concluded from sections 4.6 and 4.11; and these are 1) difference in students' educational backgrounds and schooling built their attitude towareds indepdent learning or teacher-oriented learning (see section 4.6 for details), 2) affordability of costs of mobile internet and mobile devices depends on the students' socio-economic background. However, there were a few more factors associated with a typical developing country's socitey' social and cultural norms. These factors- emerged from the analysis of students' focus group discussion sessions- include the need for awareness about mobile learning, motivation among the students and possible negative exploitation of mobile learning facilities and resources. These aspects particularly highlight some of the socio-cultural factors that

may influence any future mobile learning initiative in Pakistani universities. Following sub-sections include more detailed discussion about these newly emerged socio-cultural factors.

4.12.1 Awareness

From the students' comments it was apparent that, while some of them were aware that they could undertake learning activities using their mobile devices, many others were not aware of this kind of opportunity. They believed that awareness about mobile learning should be raised among the teaching and learning community before any practical initiative is taken. Students and teachers need to be educated in this regard, and their questions and concerns should be answered and resolved in order to make the mobile learning initiative a success.

> *'I think we need to create awareness among the people. They should be told by an advertisement that a mobile device can be used for better purposes such as teaching and learning. They should be motivated and facilitated for mobile learning.' [Uni C - Student4]*

> *'Students' interest should be developed by creating different interesting tasks in mobile learning mode. They will always try new things.' [Uni C - Student1]*

> *'Let me give you an example. Years ago when computers became common among Pakistani people, many people purchased a computer. However, people were not very clear about the purpose of a computer; they used it to watch movies only. Just like that, students should be made aware of the uses and benefits of mobile devices which may include using the device for learning purposes in addition to using it as a phone.' [Uni C - Student5]*

> *'In my opinion, mobile learning is an excellent idea; however, people think about the negative aspects of something more than its positive aspects. Therefore, I suggest it is necessary to create awareness about mobile learning among the community of students and teachers; then it will be successful.' [Uni A - Student1]*

One student suggested that universities could make a transition in stages from face-to-face learning to a blended learning environment where mobile learning would also be an option. In this case, students would be more aware of the benefits that mobile learning can offer and be more motivated to embrace mobile learning.

> *'I think initially, software or apps regarding mobile learning should be installed on mobile devices for students by the university. They should also introduce cheap internet mobile learning packages.' [Uni C - Student3]*

Only a few researchers in the literature from India and Malaysia have touched upon this topic of creating and assessing the awareness of mobile learning among students before testing a pilot project (Alzaza and Yaakub 2011; Kumar et al. 2010). The majority of researchers have not mentioned the need for creating and raising awareness about mobile learning, particularly for audiences in developing nations, this has been a major gap in the literature. This finding not only confirms the literature but also contributes to filling the knowledge gap. Future researchers may add the raising of awareness about mobile learning in mobile learning research design as a pre-cursor to the mobile learning research project or trial implementations.

4.12.2 Motivation

Generally, students were happy and motivated to be involved in future mobile learning initiatives. In spite of the problems and concerns that they voiced, they mentioned that they would like to enrol in a course offered partially in mobile learning mode.

> *'I would definitely take that course because I would learn a lot from it.' [Uni C - Student3]*

> *'There are some problems but I would take a mobile learning course in spite of all the problems because I will learn from this course.' [Uni C - Student4]*

'If they integrate mobile devices into the course in a way that is useful for students in the future too, then everyone would like to enrol in that course.' [Uni B - Student9]

Barker et al. (2005) discussed motivation as one of the success factors of mobile learning in developing countries. Oliver and Goerke (2008) found that undergraduate students in an African country were more motivated and excited about being involved in mobile learning compared to their Australian counterparts. Similarly, the current study showed students in Pakistani university environments were happy and willing to embrace mobile learning despite their concerns. Further, students were found to be motivated and willing to learn independently of the teacher's involvement when they were asked about it.

'It also depends on motivation level. For example, if I like mathematics, I will solve problems even if I have to work hard to find a solution to the problem. For other courses, however, I would not work so hard, what I mean is that if you have motivation for something, you can do it without a teacher's help or intervention.' [Uni A - Student11]

'I agree with Student11. I think no human being is dumb or too smart; it just depends on how much effort you want to put in to achieve your goal. It does not depend on a specific teacher's help if somebody really wants to learn something. If you want to learn something, you will read more books, do intensive internet search even if you are using mobile internet to get instant and the latest updates. You will do whatever it takes to achieve your target.' [Uni A - Student7]

4.12.3 Negative uses

Participants discussed the negative use of mobile devices in learning environments by indicating the potential risks associated with possible future implementation of mobile learning in universities or other higher education environments. They reported a number of current negative practices by some students such as using a mobile device for cheating purposes during classroom quizzes and examinations.

However, some of them suggested a few ways to overcome this problem such as the use of blocking devices in examination venues; as they said:

> *'I have a concern to discuss. Many students use their mobile device for cheating purposes, particularly during examinations. I suggest that examination venues should have some blocking devices that prevent students from using their devices during that time.' [Uni A - Student13]*

> *'There is one important issue that needs attention. Students use mobile devices for some useless activities. I am afraid if mobile learning is introduced, students would exploit this opportunity to engage in other activities which might distract them from learning. There should be some restrictions if mobile learning is introduced to stop negative activities of students.' [Uni C - Student5]*

Students also commented that many parents are concerned about their children's excessive use of mobile devices. When mobile devices are made available to students for learning purposes, some may exploit the situation by using the devices for purposes other than learning such as watching non-educational material available on the internet. Further, if students were provided with better mobile internet options for the purposes of mobile learning, they are more likely to use that mobile internet for social networking activities, thereby distracting themselves from learning-related tasks.

> *'Parents are already fed up with the excessive use of mobile devices by their children. Young people remain engaged with their mobile devices due to free or cheaper access to unlimited SMS. If data options such as Wi-Fi and GPRS are added, it would be a real worry for parents.' [Uni B - Student5]*

Some participants shared their experiences regarding the use of mobile devices in classrooms. They reported that a number of students are misusing these devices, rather than utilizing them for study-related tasks. They used them for messaging, chatting and watching material on YouTube. These practices not only deprive those particular students of classroom learning but also distract other students from classroom proceedings.

> *'Sometimes, students misuse their mobile devices during a lecture. Instead of listening to the lecturer, they chat or send SMS to friends and girlfriends. This is a negative trend and needs to be addressed.' [Uni A - Student10]*

Traxler (2009, 10) argues that stakeholders in the mobile learning phenomenon should also emphasize that negative activities are being counterproductive to the benefits of mobile learning.

> *'Looking at mobile learning in a wider context, we have to recognize that mobile, personal, and wireless devices are now radically transforming societal notions of discourse and knowledge, and are responsible for new forms of art, employment, language, commerce, deprivation, and crime, as well as learning.'*

In mobile learning literature, the possible negative impact of mobile technologies in education has not been duly acknowledged. Many mobile learning researchers have highlighted the benefits and advantages yet failed to mention the negative aspects of mobile learning, thereby leaving a gap in extant literature. This research attempts to fill this gap and reports the finding that mobile learning implementations in higher education carry potential risks for learners, parents and universities which need researchers' attention when planning and designing mobile learning implementation projects in the future.

4.12.4 Socio-cultural Factors - Summary of Discussion and Findings

The summary of students' perceptions and expectations of mobile learning with reference to their socio-cultural backgrounds and trends is being presented in the following points:

- Students' educational background and affordability were amongst the main factors which may influence the success of mobile learning implementation in Pakistani universities.

- Students in Pakistani university environments were motivated and willing to embrace mobile learning despite their concerns about other issues such as cost and connectivity.

- Students believed that awareness of mobile learning should be raised among the teaching and learning community before any practical initiative is taken. Students and teachers need to be educated in this regard, and their questions and concerns should be answered and resolved in order to make the mobile learning initiative a success.

- Student focus group participants also suggested that universities could make a transition in stages from face-to-face learning to a blended learning environment where mobile learning would also be an option. In this case, students would be more aware of the benefits that mobile learning can offer and be more motivated to embrace mobile learning.

- Students mentioned a number of potential risk factors associated with possible future implementation of mobile learning in universities such as using it for cheating in exams or quizzes, watching unethical stuff on internet video channels (utilizing the provision of high speed mobile internet for the sake of mobile learning) and performing non-study related social networking tasks during the classroom proceedings.

4.13 Chapter Summary

Students discussed more enthusiastically about the characteristics of mobile learning such as collaboration, usability, cost, connectivity and control. However, they did not focus much on the characteristics relating to blended learning and context. The majority of the findings from the analysis of students' focus groups confirm the findings presented in extant literature. However, several new ideas emerged in relation to the Pakistani university environments as well as the social, cultural and financial backgrounds of the participants; for example, participants demonstrated enthusiasm and motivation to adapt mobile learning in their formal as well as informal learning. Student also pointed out that there is a great need in Pakistan to

make people aware of the potential of mobile learning in formal educational environments. Participants also pointed out several possibilities of abuse of mobile learning opportunities. Figure 24 on the next page presents a snapshopt of the main findings from the analysis of students' focus groups discussion sessions as reported in detail in this chapter.

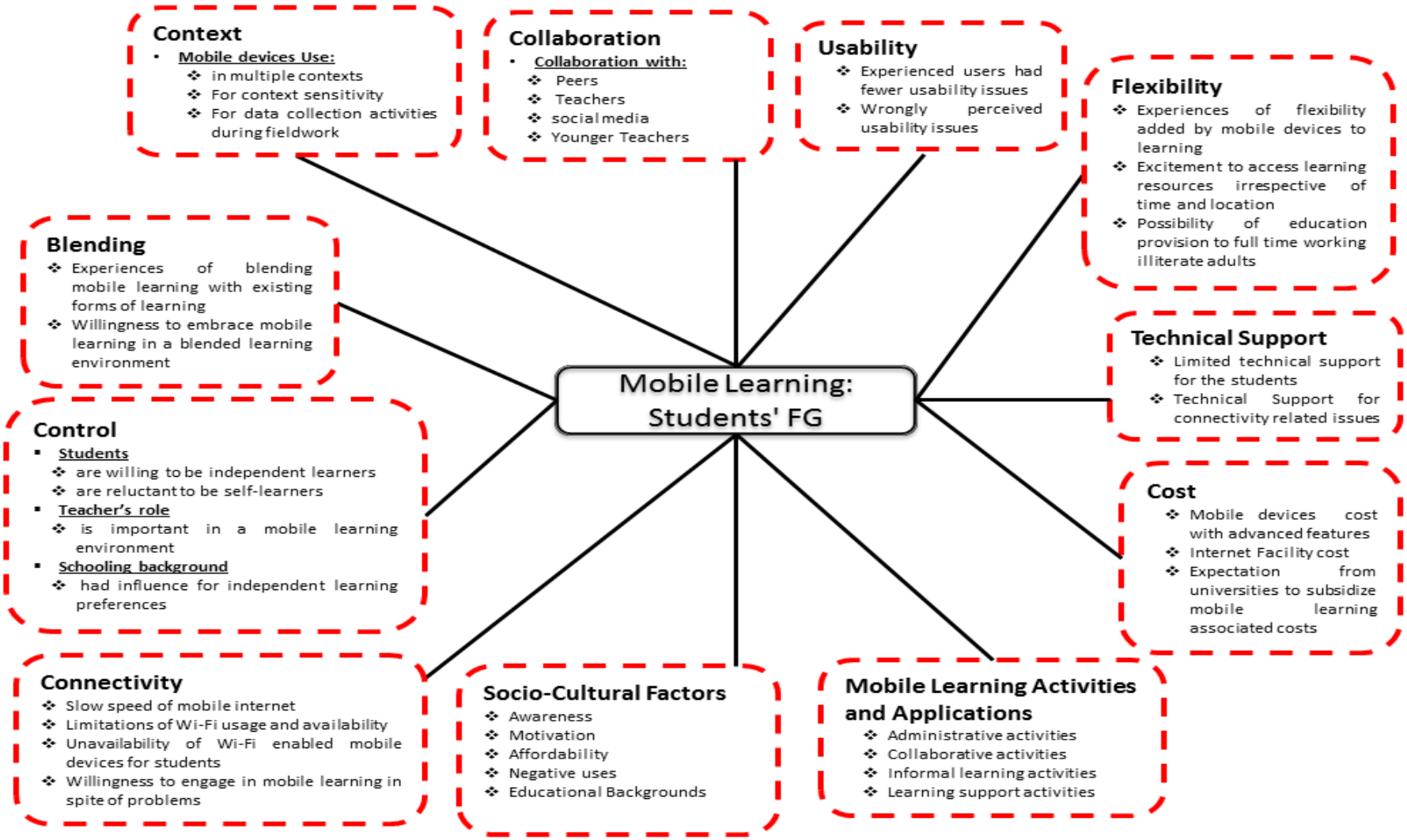


Figure 24: Summary of findings from Students' Focus Group Sessions

CHAPTER 5 TEACHERS' FOCUS GROUPS: RESULTS, DISCUSSIONS AND FINDINGS

5.1 Introduction

Results, discussions and findings from students' focus group sessions conducted in Pakistan university environments were presented in Chapter 4. The teachers' perceptions and expectations are presented in this chapter. In particular, the findings from the teachers' focus group discussion will answer the second research question of *'What do teachers perceive and expect of mobile learning in Pakistani university environments?'*

The chapter is organized according to the mobile learning characteristics comprising the main sections followed by a short summary for each section. The chapter's organization is similar to that of the students' focus groups chapter; however, the data pertains to the results, discussions and findings from the teachers' focus group discussions in Pakistani university environments.

Data was analyzed using NVivo qualitative data analysis software. Data analysis involved several stages including data preparation, data organization, coding using Nvivo, indentification of themes, synthesizing data by building relationships and models and writing memos during the process of data interpretation. See section 3.6.4 in Chapter 3 for details of the data analysis process.

As the nature of the collected data is purely qualitative, it is important to mention at the outset that discussions and findings presented in the individual sections contain different terminologies when describing a characteristic, concern, experience, theme or expectation of participants. For example, weak support for an argument is indicated by the expression *one of the participants mentioned;* moderate support is indicated by *some of the participants or a few participants* and strong agreement is

expressed by expressions such as *the majority of the participants/all of the participants/the participants*.

Each section will include a mobile learning characteristic as the main topic followed by a summary of discussions and findings for each section. A chapter summary including a summary of the main findings from the teachers' focus groups will be provided at the end of this chapter.

5.2 Collaboration - Results and Discussion

Teachers from Pakistani universities talked about communicating with their students and colleagues by using mobile devices. They used mobile devices to advise students of their assignment and project-related issues, and scheduling and rescheduling of lectures with colleagues and students. They also revealed that they have been working and engaging with students using formal and informal communication channels to assist in their learning outside the formal academic environment and to reflect in their formal teaching and learning. This is consistent with the findings of Martí and Ferrer (2012) that teachers' engagement in informal mobile learning and collaboration assisted them to improve their formal teaching and learning practices. To assist the learning activities, some teachers had set up Yahoo! groups for particular classes or groups to communicate and share information common to that group. Some of the teachers have used Facebook and chatted with students to resolve study-related matters.

The teachers also stated that they had informal communication with their students which included forwarding and sharing useful information using SMS. Socially, the teachers also send greetings for festive seasons and on special occasions. Some teachers believed that this gesture encouraged the students and to some extent, instilled confidence in the teachers. There is also an implicit notion that students may feel comfortable to discuss study-related issues with the teachers outside of formal class time. Some of the comments provided by the teachers are listed as follows:

'Yes! Exactly. This is a very good thing. We forward messages to each other and also greet in the morning. In this way, communication barriers are bridged and if the teacher knows the students personally, students also feel at ease when discussing things with the teacher.' [Uni C - Teacher6]

'It's the same thing that you can communicate with your colleagues and students and if you have any announcement, you just have to send one SMS.' [Uni B - Teacher8]

A number of researchers in the past (Chatti et al. 2010; Kukulska-Hulme and Shield 2008; Petrova 2010; Song 2008; Wang and Ryu 2009) have conducted experiments on the use of SMS and social software as collaboration tools in mobile learning. Pakistani teachers' comments regarding their use of collaboration tools for teaching and learning confirm what other researchers have reported in their results in other countries.

A university that participated was from the medical education discipline and the focus group for this research was conducted with lecturers in the dentistry department. The lecturers from medical discipline reported that dentists or dental assistants in remote villages used mobile devices to communicate and collaborate with the specialist dentists by sending pictures of patients as MMS to obtain help with diagnosis and appropriate treatment.

'There are not many dentists in our villages. If there is an assistant, then he/she can send step-by-step pictures through MMS to some dentist present in the city and can consult him/her for a particular diagnosis'. [Uni C - Teacher2]

The concept of utilizing the collaboration opportunity offered by mobile learning in the healthcare profession has been investigated by a number of medical professions such as nursing and dentistry in teaching environments as well as in clinics (Garrett and Jackson 2006; Luanrattana et al. 2010; Mulliah and Stroulia 2009; Smordal, Gregory, and Langseth 2002; Smordal and Gregory 2003)

5.2.1 Collaboration - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the collaboration. The following is a summary of the major points:

- Communication and collaboration does occur between students and teachers using mobile devices to discuss projects, assignments, scheduling of lectures and workshops.

- Teachers assisted students in their learning formally and informally by communicating through their mobile devices both within and outside the formal academic environments.

- Teachers were members of the student class groups established on social networking sites for the purpose of sharing information and discussing study-related problems.

- Teachers and students also communicated via SMS to share information and greet each other on festive occasions; this brought them closer to each other and enhanced students' confidence to direct questions to their teachers.

- Teachers in the dentistry department collaborated with students working in remote villages in order to carry out diagnoses of patients whose images were sent to them by students via MMS and taken using their mobile device cameras.

5.3 Usability - Results and Discussion

Teachers talked about usability problems they have faced including: small screens, tiny keypads and limited memory and processing capabilities compared to a laptop or desktop computer used for learning tasks. They reported that using a mobile device for browsing the internet and checking emails is very convenient; however, learning tasks also involve writing of text which is very difficult to do on mobile devices because of limited input capabilities.

'When we use a mobile device, the screen is small and it is difficult to use it for teaching and learning.' [Uni A - Teacher2]

'It is good for browsing but it is difficult to write text.' [Uni A - Teacher3]

'If one wants to check emails then there is no issue, but if one wants to write any text, then it is difficult.' [Uni A -Teacher6]

As a solution to usability related issues, one teacher pointed out the availability of various mobile device versions in the majority of websites particularly designed to be opened and operated on a mobile device interface. Another teacher argued that these mobile versions were not available for every website; therefore, users had problems with usability issues anyway.

'I think there are websites especially designed for mobile devices. These are not too heavy to be loaded on mobile devices, so I have no problem.' [Uni A - Teacher1]

'I think students can only use those websites which have mobile versions; others cannot be used. This means restricted access, doesn't it?' [Uni A - Teacher2]Chen et al. (2010) also found that the usability of the devices was one of the major obstacles to teachers' adoption of ubiquitous computing options in learning environments. Teachers in Pakistani university environments also discussed that there were several other non-usability-related issues mistakenly considered as mobile device usability issues. For instance, some of the students tried to undertake lengthy assignments and programming tasks on mobile devices. When they found it difficult to complete those tasks on mobile devices, they assumed that this was related to the usability of mobile devices for teaching and learning. Similarly, network access, connectivity and configuration issues were wrongly perceived as usability issues, instead of seeking appropriate technical support from the appropriate telecommunication company.

It can be argued that users need appropriate training in order to be involved in mobile learning, which they do not have currently. So, the lack of appropriate training made them think that these were more usability issues. Therefore, the provision of

awareness and appropriate training - even informal training provided by friends and family members - would decrease the usability issues reported by the teaching and learning community.

Similar to the findings of this research, literature in mobile learning also reflected the necessity to provide support and training for teachers intending to initiate mobile learning. Herrington et al. (2009) propose that in a mobile learning environment, teachers do need ongoing training to make themselves comfortable with the technology and educational content to be used on mobile devices. Koole (2009), in her mobile learning framework includes the provision of technical support for students and teachers in order to have seamless transition to mobile learning from traditional learning options. Sife et al. (2007) mention that technical support and teacher training present major challenges to the possible implementation of mobile learning in developing countries.

Another participant from the teachers' focus groups disagreed and said that before considering the training needs, they needed advanced devices and tools which were not available to everyone in Pakistani university environments. If the teachers and learners had smart devices available to them, they would learn how to use them by themselves or with little informal training. Findings from Perry (2003) and Stockwell (2008) corroborate the findings of this research as they found that the ownership of the mobile devices made learners motivated and excited to be involved in mobile learning. Also, smart mobile devices exhibit more user-friendly interfaces resulting in fewer usability problems and greater suitability for mobile learning tasks.

> *'Another point worth considering is that everyone says that this is easy to use. It is easy to use once you have learned and started using it. Initially, I learned from my brother who is a telecom engineer in Zong – since this is his field, that's how I know about this – otherwise it's very hard to learn this and mostly everyone learns from one another.' [Uni B - Teacher5]*

One teacher mentioned that, sometimes, problems were related to network access and connectivity but were wrongly attributed to usability issues. Hence, a telecom provider should be called upon to resolve issues, rather than assuming that the problem is a mobile device usability issue.

'Another main problem that you face is defining the access point and, at times, establishing the settings. If you, for instance, you change the SIM card of a mobile phone, then the entire settings are affected and once they are, it is very hard to bring them back' [Uni B - Teacher5]

5.3.1 Usability - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the usability of mobile devices for learning. The following is a summary of the major points:

- As obstacles to the adoption of mobile devices for the purposes of teaching and learning, common mobile device usability issues such as small screen, tiny keypad and small amount of memory were reported.

- It was easier for teachers to use mobile devices to browse the internet and check emails rather than writing lengthy texts.

- The availability of mobile versions of a number of websites might decrease the mobile device usability issues.

- Several non-usability-related issues were wrongly perceived as usability issues by the teaching and learning community. These issues include lack of user experience, lack of awareness, lack of appropriate training, unavailability of smart mobile devices with user friendly interfaces to the majority of users, and network connectivity problems.

5.4 Context - Results and Discussion

Teachers in Pakistani universities were not aware of the many contexts in which mobile devices could be used. The majority of the focus group participants did not experience any contextual use of mobile devices for learning with the exception of teachers in the dentistry department who shared their experiences and recognised the potential uses of contextual mobile learning, especially in relation to diagnoses and practical tasks in remote areas and villages.

> *'We have clinics where you have to diagnose remotely and there you also have to prescribe medicine remotely.' [Uni C - Teacher5]*

Another dentistry lecturer pointed out that he could use mobile devices for students' learning about the use of dentistry implements instead of each student memorising why a particular tool is being used for a particular task; it would save them time and effort. Students would be working more independently of teachers and obtaining information quickly as needed. Literature confirms this finding regarding the use of mobile devices by medical students in clinical practices in multiple contexts as discussed by Mulliah et al. (2009) and Luanrattana et al. (2010).

During the focus group discussions, another lecturer from the dentistry department stated that he had to take pictures of patients' dentures for diagnosis and treatment purposes; lecturers could use mobile devices to take pictures and store them for future use.

> *'In some cases, we take pictures of the denture and put these up in software and it gives the result in no time about particular problems. Similarly, in orthodontic issues, we put pictures into software to devise a treatment plan for patient. Mobile devices would be of great advantage for such cases. As our work is practical, it is necessary to get real-time data from patients, and store the data and use it for experiments.' [Uni C - Teacher3]*

In the case of contextual use of mobile devices for learning, one teacher assumed that he would have to prepare learning resources capable of gathering contextual data. He believed that it would be very difficult for them to keep resources up to date if mobile devices have to sense contextual data.

> *'This is a good idea to have mobile devices that have the capability to sense what is happening in the environment. However, to keep the information updated and get the system running, it would require a lot of effort.' [Uni C - Teacher1]*

5.4.1 Context - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the contextual use of mobile devices for learning, as follows:

- Generally, teachers did not know about the use of mobile devices in multiple contexts except for the teachers in the dentistry department.

- Dentistry lecturers reported using mobile devices from remote areas and villages to collaborate with colleagues in cities for consultation and diagnostic purposes.

- Dentistry lecturers also reported using mobile device cameras to take pictures of patients' teeth and sharing those pictures and information with other colleagues using SMS and MMS.

- The use of mobile devices in medical practices was also reported in mobile learning literature.

5.5 Blending - Results and Discussion

Teachers in Pakistani universities believe that mobile learning should be offered in conjunction with existing modes of learning. They agreed with the partial introduction of mobile devices in learning; they believe that the teacher's presence and role could not be replaced by a mobile device or computer. Offering mobile learning in a blended learning environment has been discussed frequently in mobile learning literature, particularly the literature published over the past decade (Fuchs 2012; Gururajan et al. 2011; Parsons 2011; Shen, Wang, and Pan 2008; Wang et al. 2009).

It was noted during the focus group discussions that the majority of participants presumed that blended learning was more likely to be introduced and implemented in Pakistani university environments where mobile learning would be an innovation in educational ICTs; only a few teachers commented explicitly on the option of blending mobile learning with existing forms of learning.

'May I give you an example? There was a time when, in examinations, calculators were not allowed. Then a simple non-scientific calculator was permitted and nowadays, scientific calculators are even used. The problem with scientific calculators is that they should not have any memory, etc. This is a sign of continuous development. Just as a calculator supports your assessment, a mobile device supports your learning. It can never replace teaching but it is there for the sake of learning support.' [Uni B - Teacher9]

'You said 'partially'; If we keep this to 'partially' then this will stay feasible. In micro-teaching there is set induction and your presence in front of your students is very important. You can transfer them to e-books, lectures, etc. but the actual lecture must be conducted face-to-face.' [Uni B - Teacher3]

It is evident from the teachers' focus group statements that they did not want mobile devices to replace teachers. Instead, they want to blend mobile learning with face-to-face learning.

5.5.1 Blending - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the blending of mobile learning with other forms of learning. The following is a summary of the major points:

- Teachers in Pakistani university environments agreed that mobile learning should be offered in a blended learning environment in Pakistani universities.

- Teachers support the use of mobile devices as complementary tool and did not want traditional face-to-face teaching and learning to be replaced by mobile learning.

- Teachers wanted to use mobile devices in learning to support and facilitate existing modes of learning.

5.6 Control - Results and Discussion

All participant teachers agreed that the role of a teacher was pivotal in the learning process as interaction with teachers helped students to clarify concepts and theories which otherwise might have hindered their learning. Teachers in the focus groups had mixed views about the teacher's role in the mobile learning environment. On the one hand, it was highlighted that the importance of face-to-face learning could never be over-emphasized. On the other hand, an acute realization of the importance of mobile learning was verbalized by the university teachers. They expressed the view that mobile learning could be integrated with face-to-face learning in order to add value to the learning process.

> *'The things that a teacher can make you understand the topic, you can't understand with independent learning. It has been my experience that whenever I left my lecture I had to read things twice or thrice but still couldn't get them. For this reason, I had to go to the teacher. There is no substitute for a teacher's experience.' [Uni C - Teacher4]*

> *'Problem-based learning is very popular these days. It's been implemented in Aagha Khan University, Karachi. In problem-based learning, first you are given an outline or introduction and you can also get books and handouts. All the students will study it. It would not happen that 40 students sit and the others would study; rather seven to ten students will work together. The supervisor will also be available to discuss problems and contribute to the discussion. In this way, the learning is engaging and much more interactive. By working more closely with peers and teachers, students have a better and greater capability to think and work independently. That is why I think that it is possible to let students learn independently and mobile learning is the best fit for this.' [Uni C - Teacher9]*

Mobile learning literature does not deal with teachers' attitudes to the introduction of mobile learning in university environments, particularly in developing countries. Uzunboylu and Ozdamli (2011) studied school teachers' perceptions of mobile learning in Cyprus and found that teachers were fairly positive about the possible

introduction of mobile learning in schools, however, the teachers did not want the their role to be undermined or misunderstood by students with access to mobile learning facilities. Similarly, teachers in Pakistani universities were apprehensive and sceptical that the possible introduction of mobile learning in university environments might undermine the role of teachers and its significance.

Independent learning is facilitated by mobile devices (Chen et al. 2004). This fact was reiterated in the university teachers' focus group discussion. One of the teachers pointed out that when students were given projects, the mobile device was a very useful tool for research purposes as it was available to students anywhere and at any time. Students did not have to put aside a special time for their research. Rather, they could access the internet via mobile devices whenever they needed to do so for their studies.

> *'Mobility offers a great number of advantages. In particular, students don't feel burdened in doing learning activities when using mobile devices; rather, they are excited and motivated. I think it is easy to access learning resources from a mobile device, easier to be connected with teachers and peers and easier to use.' [Uni A - Teacher6]*

Another teacher added that mobile learning also saved teachers' time. Students were given lecture topics beforehand; students could prepare the topics using their mobile devices. Teachers were able to capitalize on students' prior learning of the topic and carried on with advanced level discussion during the classroom session (Chen et al. 2010). However, this point of view was opposed by another teacher who considered that there were some students who were reluctant to learn independently of the teachers; so mobile learning might not benefit such students.

The idea of controlled (by teachers) but independent learning (by students) was supported by all participants (Frohberg, Göth, and Schwabe 2009). Teachers in Pakistani universities stated that students had been bombarded with the information explosion on the internet and they tended to be diverted from the desired goal of learning without appropriate guidelines. Therefore, participants recommended that students' independent learning must be controlled and designed by the teachers so that both teachers and students could make the most of this technology infusion in

learning environments. The participants agreed that a teacher could direct students to particular learning resources and websites related to the topic to be browsed by the students in their own time independently of the teacher.

> *'You have asked how much the teacher should be involved in this. The teacher is there to guide and direct the students to the appropriate learning resources. Assuming that the teacher knows about the related learning websites, he can guide the students. Otherwise, internet browsing is a tough job.' [Uni B - Teacher10]*

5.6.1 Control - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the teacher's role in mobile learning. The following is a summary of the major points:

- Teachers had mixed responses regarding their control of the students' learning process in reference to the mobile learning provision. Some teachers were very positive that students would be learning independently of their teachers through mobile learning; however, some participants were sceptical and apprehensive about the compromised role of the teacher in the students' learning process if mobile learning were an option in a formal learning environment.

- Teachers reported that mobile learning improved their teaching practice and made classroom time more productive. They asked students to prepare and read the topic on mobile devices prior to coming to class. This way, the prepartory work assisted teachers to initiate higher level of discussion in the classroom.

- The majority of participants in the focus groups agreed that teachers should be able to design and control students' learning in the formal mobile learning environment. Teachers could direct the students to appropriate resources and students could access and learn from those resources in their own time as independent learners.

5.7 Connectivity - Results and Discussion

Regarding network access and connectivity, teachers expected the university to provide the necessary infrastructure to facilitate the successful implementation of the mobile learning initiative. They also talked about poor network connectivity in remote areas where, during visits to relatives, they might not be able to stay connected with their peers and students. They shared their experiences about poor network coverage in some areas at times; they also expected to have internet availability anywhere and at any time if mobile learning were formally introduced into the university environment.

> *'I cannot redesign infrastructure; what we have to do is to redesign learning material for mobile devices. But having infrastructure is a basic thing. The university needs to provide required services and resources for staff to use for this purpose.' [Uni A - Teacher8]*

> *'The situation of our network right now is that if we go to some rural area, GPRS and EDGE are not enabled there. So our internet access is completely disconnected in that case. That's the main problem and while travelling, it can become enabled at some point and disabled at another. Even when travelling on main motorways, you can face this problem.' [Uni B - Teacher5]*

> *'So firstly, we should spread the network so much that it is available everywhere; and secondly, internet must also be available on it.' [Uni B - Teacher2]*

Problems of mobile network connectivity for learning have also been reported by a number of researchers investigating mobile learning options in other developing countries such as South Africa, Latin America, India and Indonesia (Barker, Krull, and Mallinson 2005; Kim, Miranda, and Olaciregui 2008; Kumar et al. 2010; Sari and Tedjasaputra 2008). However, in spite of network connectivity issues, all of these researchers reported positive outcomes when assessing the benefits of mobile learning implementation in developing countries. Similarly, a female literacy project

conducted via mobile learning ran successfully in the rural areas of Pakistan according to a UNECO mobile learning report that showed network connectivity was not a major issue even in rural areas of Pakistan (UNESCO 2010). Currently, another project is under way to empower rural women of Pakistan through mobile learning (UNESCO 2013b).

Participants also expressed their concerns about the availability of 3G technologies in Pakistan. They stated that it was a controversial issue and that the government did not issue 3G licenses to the telecom providers to operate 3Gs. However, GPRS and EDGE technologies were available at that time (PTA 2009, 2013; Sims 2013). Participants had been experiencing slow mobile internet speed with these technologies; therefore, it was difficult for them to engage in mobile learning activities outside the range of Wi-Fi. They stated that currently Wi-Fi was the best option for the teaching and learning community in terms of mobile learning activities although Wi-Fi is restricted on university premises; however, at least within the range of Wi-Fi, they had the flexibility to move around and take their learning with them.

> *'The thing with Wi-Fi is that it gives you adequate speed. That's an advantage. But it limits your options in terms of location. On the contrary, in my opinion, an added advantage of Wi-Fi is that it does not leave you bound like PTCL, where you need to connect to a cable. So with Wi-Fi you have more mobility, at least within the limits of a geographical area.' [Uni B - Teacher5]*

> *'And within the university premises, all the students can carry out their learning activities collectively.' [Uni B - Teacher3]*

One teacher expressed his concerns that if students and teachers use university-provided Wi-Fi for mobile learning activities, then the network could become overloaded with a large number of users.

> *'The use of the Wi-Fi may slow down or be overloaded if there is a high number of users who have logged on simultaneously.' [Uni C - Teacher4]*

Generally, teachers had concerns about network connectivity, particularly for the mobile internet options available to them at that time; they wanted more advanced technologies with higher mobile internet speeds so that mobile learning could operate smoothly. However, they were prepared also to start the mobile learning initiative with Wi-Fi as that was the best available option for accessing learning resources using mobile devices while on campus. By using the WI-Fi, this might also reduce the load on computer labs and in classrooms, thereby conserving university resources.

5.7.1 Connectivity - Summary of Discussion and Findings

This section provides a summary of the major discussion points and findings regarding the connectivity or network access for mobile learning:

- Teachers expected universities to facilitate the introduction of mobile learning by providing the necessary ICT infrastructure; for example, by negotiating with telecom provider companies better mobile internet plans for staff and students.

- Teachers complained about poor network coverage in some rural and remote areas where they might stay for few days to visit relatives; a lack of coverage would affect their engagement in mobile learning during that period.

- Network connectivity problems have been reported also for other developing countries in the mobile learning research literature; however, these issues did not prove to be a huge barrier in mobile learning pilot implementations. Similarly, in spite of facing connectivity-related issues at times, teachers in Pakistani universities were happy to switch to and experience formal mobile learning engagement if it is offered in near future; this indicates that network related issues are not serious enough to present a significant obstacle to the introduction of mobile learning in Pakistani university environments.

5.8 Flexibility - Results and Discussions

Focus group discussions highlighted a number of mobile learning characteristics; flexibility was one of them. Teachers reported that mobile learning is flexible, instant, personal, informal and motivating for themselves and for their students as well.

> *'If I have a mobile learning facility, then students can ask me many basic questions anytime and anywhere.' [Uni A - Teacher1]*

> *'I agree that it is far easier to use a mobile device for learning than to switch on the laptop and then find the answer.' [Uni A - Teacher3]*

> *'All other things are shared, but mobile is personal and as you know, a personal thing is always personal. For example, if all other computers are occupied in the lab, they have the option of using mobile devices to access learning resources and keep the learning process going.' [Uni A - Teacher7]*

Traxler (2009) and Koole (2009) have also used similar terminology to indicate that flexibility is one of the unique characterisitcs of mobile learning for the teaching and learning environment (Koole 2009; Kukulska-Hulme and Traxler 2005; Traxler 2011; Traxler 2009).

It was mentioned by one teacher that if the internet-enabled mobile device were available, this would give them the flexible option to be engaged in teaching and learning wherever they are. While preparing a lecture, if they needed more clarification instantly, mobile learning proved to be a big support on the spot and they could explore the topic from different angles. On the other hand, if the internet was not readily available when they had to look up something, their motivation level went down and they postponed the task for some other time.

> *'There is also the human psyche to get things done instantly. If computers are occupied or you feel too lazy to turn the computer on, you may delay*

things. However, you may get things done quickly and instantly if you are in mobile learning mode.' [Uni A - Teacher7]

'Sometimes it happens to me. If I am studying something and want to know more about some concept, at that time I am motivated and determined to learn it; if I have the mobile internet facility, then I will use it. However, if I missed this time, I may not go for it later on because of less motivation or I will forget it.' [Uni A - Teacher8]

It was pointed out also by another teacher that the flexibility provided by mobile learning enhanced students' motivation. It also made them understand the importance of self-learning. Teachers found that students were eager to learn because they had no difficulty accessing the learning resources. Mobile learning made everything readily available to them.

'The thing that you have in your hand is very easy to use. So, mobile learning also helps students to understand the importance of self-learning and students have more control over their own learning.' [Uni A - Teacher6]

Similar to the findings of this research, a number of researchers have associated instant access to learning resources with the enhanced motivation of the learners to be involved in learning across different times and spaces of their daily lives (Chao and Chen 2009; Evans 2008; Issa, Al–Bahadili, and Abuhamdeh 2011; Kukulska-Hulme 2010; Lu and Korukonda 2008). In addition, another teacher considered that mobile learning is available without the immediate availability of the mobile internet because a mobile device could be used to store necessary information and teaching notes without needing to have the internet available at a particular time.

'I think it is not necessary to have internet access. If you are studying a book and cannot find the meaning of some word, you may note it down on your mobile device and search its meaning later on (if your mobile device is not internet-enabled). I think it is handy to have a mobile device to take notes even when you are reading a book.' [Uni A - Teacher6]

The notion of using mobile learning in offline mode or undertaking mobile learning activities without the availability of the mobile internet has not been much discussed in mobile learning literature except one study in Nepal (Shrestha, Moore, and Abdelnour-Nocera 2010). A study of what students and teachers could do even when the mobile internet is not available would yield interesting findings. People in the developing world, where network connectivity may become unstable at times, would benefit from an offline mode of mobile learning.

Teachers in the focus group discussion sessions stated that they did make use of flexibility of mobile devices for multiple purposes inside and outside the university premises. They could inform students about the scheduling of forthcoming learning activities in lectures, they could communicate to the whole class via SMS, and they could also register their leave application via SMS to the relevant office. Numerous experiments and studies have been conducted into the use of SMS for mobile learning, with positive results being reported in the literature (Cavus and Ibrahim 2009; Ozok and Wei 2007; Petrova 2010; Scornavacca, Huff, and Marshall 2009; Wang and Ryu 2009; Young et al. 2009).

> *'Yes, you can inform students of any class cancellation or of any quiz you intend to give.' [Uni B - Teacher6]*

> *'You can even send your leave application, while at home or working from home.' [Uni B - Teacher3]*

> *'You don't have to go anywhere and can communicate with the whole class from home.' [Uni B - Teacher5]*

There were some perceptions and comments by teachers about the other side of the picture in reference to the flexibility offered by mobile learning. A couple of teachers mentioned that sometimes the availability of data could become problematic because students might not take an interest in the lecture, assuming that they could access information at any or another time. This assumption could decrease their interest in the learning that is occurring inside the classroom.

'When students know that all the material is available, they don't attend the class and only study at the last minute. Assessments might be taken for granted just because they have a mobile device handy for learning; they might not prepare for the assessments beforehand.' [Uni C - Teacher5]

'They don't study from the very beginning, but they use their mobile and study on the spot; they might not put sufficient effort into that topic.' [Uni C - Teacher1]

5.8.1 Flexibility - Summary of Discussion and Findings

This section provides a summary of discussion and findings regarding the flexibility of mobile devices for learning. The following is a summary of the major points:

- Teachers stated that mobile learning is flexible, instant, personal, informal and motivating for themselves and for their students.
- Teachers found instant access to learning resources very beneficial when preparing their lectures outside of their usual work area.
- Teachers experienced that mobile learning enabled themselves and their students to be more independent learners and more motivated to complete learning tasks on time.
- Mobile learning could also be used by teachers and students even without the availability of the mobile internet for certain purposes such as using the dictionary, taking notes and reading previously downloaded learning material.
- According to the experiences of teachers, SMS has been proved to be a very useful tool for disseminating important admin information to large classes of students.
- Teachers perceived that students could exploit the availability of learning resources anywhere and at any time in lieu of attending lectures.

5.9 Technical Support and Training Needs - Results and Discussion

When asked about technical support, there were mixed responses among teachers in Pakistani universities. A number of the participants maintained that they did not have many technical issues regarding mobile internet or related to mobile devices. Many of them were able to resolve their issues most of the time either by contacting a telecom provider or discussing the problem with friends and family members. Therefore, they believed that there was no need to arrange technical support particularly for mobile devices or the mobile internet usage issues; personnel in the existing IT/technical support department could cope with additional users if they faced any technical issues in terms of operating mobile devices and using the mobile internet for the purpose of mobile learning.

> *'Definitely, it can be but I think technical support is not necessary here, because there are few people who would use this help. If you dedicate resources for just a few people, then it would be a waste. I think it is better for them to seek technical support from the mobile company or telecom provider.' [Uni A - Teacher6]*

A few teachers reported that they had faced minor issues and were able to resolve these with the help of family and friends. However, a couple of participants complained that they had faced so many problems in using the mobile internet that they had lost interest in it. They stated that the mobile internet downloading speed was so slow that it was a mere waste of time; they decided to browse the internet using their laptops instead of mobile devices because a laptop computer was simpler to use and more efficient for them.

> *'Actually, I encountered a lot of problems while using it, so I rarely use it now. I experienced a very slow downloading speed, and at times you don't have the time to wait for so long. Moreover, some websites don't support these things. So because of a shortage of time, I've minimized this activity completely.' [Uni B - Teacher1]*

> *'I used it before but left it because my system was falling prey to viruses. They were posing problems. Also, I have the laptop with me at all times, so if I ever need to use the internet, I can use the laptop.' [Uni B - Teacher2]*

> *'The laptop is preferable due to the speed factor, since the slow speed of mobile internet irritates the user.' [Uni B - Teacher1]*

On the other hand, in spite of facing fewer problems in using mobile devices and the mobile internet, in general, many participants believed that teachers should receive adequate and appropriate training prior to the introduction of mobile devices as learning tools in a Pakistani university environment. All participants agreed that there were some university teachers who might not be conversant with modern IT gadgets. Therefore, training to use a mobile as a learning tool should be provided by the universities so that this readily available device may be turned into a learning platform by both teachers and students.

> *'There should be the facility of Wi-Fi, other necessary software and an IT specialist to train us because we don't belong to the IT field; therefore, we will need it, so that with the help of IT support person, I may be able to be involved in mobile learning successfully.' [Uni C - Teacher1]*

The literature confirms these findings as similar results have been reported in other mobile learning studies where teachers needed more technical support and training to engage in mobile teaching learning at different educational levels (Chen et al. 2010; Fuchs 2012; Uzunboylu and Ozdamli 2011).

During the focus group discussions, it was also emphasized that training sessions should be held on a regular basis so that teachers could keep abreast with the latest inventions and applications. This ongoing training would encourage teachers to embed and blend mobile learning into their traditional mode of teaching.

> *'We are given training on how to use software or devices and this sort of training should be continued and there should be training sessions after 6 months or after 1 year.' [Uni C - Teacher4]*

The question of creating content for mobile learning was also discussed. At this point, almost all participants expressed the need for training to prepare and customize learning content for the mobile devices. All participants considered training for teachers to be an imperative step prior to designing and redesigning content for mobile learning.

> *'I personally feel, after seeing the advancements in technology, that mobiles are replacing laptops. When the concept of computer-based learning was introduced, teachers were trained likewise. Similarly, this is the case with mobile devices.' [Uni B - Teacher5]*

> *'We cannot limit this training to running just software; rather, we should give continuous training on the contents that will continuously develop.' [Uni B - Teacher9]*

> *'If we are given regular training or we are updated regularly, then there would be no need for help every time.' [Uni C - Teacher7]*

The provision of appropriate training and adequate technical support for teachers also was considered as one of the major issues determining teachers' engagement in mobile learning by Cobcroft (2006) and Herrington et al. (2009).

It was noticed that teachers from the dentistry department were more vocal about their training needs and stressed the importance of continuous training for teachers in order to integrate mobile learning in their teaching and learning environment. The teachers from the other two universities had IT, telecommunication and electrical engineering backgrounds, so most of them were quite comfortable with the latest technologies and mobile devices; therefore, they did not express much concern about training. It was observed that teachers with a dentistry background were less exposed to the latest information and communication technologies and, therefore, wanted more training and technical support.

In terms of their own learning, teachers stated that mobile learning proved to be a source of knowledge enrichment for them. As mobile devices were always available, teachers exploited online sources and made their teaching more vibrant and up-to-

date. One of the teachers mentioned his practice of downloading and benefitting from lectures available on the websites of various highly ranked universities across the world.

> *'I download lectures from the Website of Berkeley University.' [Uni B - Teacher3]*

> *'This has a dual policy so at one end you are using their lectures for your own benefit and at the other, your own lectures can be used by someone else.' [Uni B - Teacher6]*

> *'Students and teachers both benefit from this.' [Uni B - Teacher1]*

> *'You can benchmark yourself through this as well. The teaching quality at Berkeley is much higher comparatively.' [Uni B - Teacher9]*

> *'Teachers are being well-trained through this practice. This has greatly improved the online lectures of our teachers as well.' [Uni B - Teacher4]*

Overall, mobile learning literature does not focus on teachers' perceptions, difficulties, training needs or challenges that they face when becoming involved in mobile learning initiatives in universities, secondary and primary schools. An analysis of focus group discussions with teachers in Pakistani universities shows that they do need to have continuous technical support and training to motivate them to engage productively in mobile learning. This finding from Pakistani universities may be generalized to similar stakeholders in both developed and developing countries.

5.9.1 Technical Support and Training needs: Summary of Discussion and Findings

This section provides a summary of the major discussion points and findings regarding the need for technical support for mobile learning:

- Teachers facing minor technical issues were able to resolve those issues with a little help from family, friends or telecom providers.

- A few teachers encountered so many technical obstacles that they stopped using a mobile device for learning activities and preferred laptop computers instead.

- All teachers agreed that they would need continuous training and support to integrate mobile learning into their traditional learning environments.

- Teachers from the dentistry department reported more technical issues and asked for more training compared with their counterparts having IT and telecom engineering backgrounds.

- Teachers also used mobile devices for their own learning and to benchmark themselves with the teaching quality in universities in developed countries.

5.10 Cost - Results and Discussion

The participants in the teachers' focus group identified a number of issues related to cost if mobile learning were introduced in Pakistani university environments in future. Firstly, the cost of smart mobile devices, which they called Wi-Fi-enabled mobile devices, would be prohibitive for the teachers and more so for the students. According to the teachers, the availability of smart phones would be a major obstacle to the implementation of any mobile learning initiatives in Pakistani university environments.

> *'As students don't have mobiles of very good quality here because these are costly, so they don't purchase it and have just simple mobiles. Sometimes these don't have even GPRS, so how can they be able to learn all this?' [Uni C - Teacher4]*

Similar concerns about the cost of mobile devices were expressed by a number of researchers in the mobile learning literature which confirm these findings about cost in Pakistani universities (Dyson et al. 2009; Issa, Al–Bahadili, and Abuhamdeh 2011; Litchfield et al. 2007). However, Lundin (2010) suggests that education

providers should try to integrate students' owned hand-held devices for the purpose of mobile learning; this would substantially reduce costs incurred by all stakeholders.

The teachers participating in the focus group sessions expected their universities to subsidize or assist them and their students to buy expensive smart mobile devices if mobile learning were to be introduced. In this way, universities might save costs indirectly because fewer computers and less maintenance would be required in computer labs.

> *'Overall, prices should be decreased so that the university does not have to bear the whole burden.' [Uni A - Teacher2]*

> *'People purchase laptops so that they don't have to go to the computer lab. Money is also saved in this way.' [Uni A - Teacher4]*

> *'If the university provides such devices, then they are also benefiting from this. They don't have to maintain labs.' [Uni A - Teacher5]*

Some participants suggested that embracing mobile learning would be easier in private sector universities where the technology infrastructure was more advanced than that of public sector universities. Moreover, students enrolled in those private sector universities were from financially privileged backgrounds and may already had expensive smart phones. However, participants did say that mobile learning could be introduced also in public sector universities with financial subsidies from government or universities so that teachers and students could afford expensive smart mobile devices for the purpose of mobile learning.

> *'It can happen in private sector universities with richer infrastructure and modern culture such as LUMS and FAST. Students of LUMS and FAST have advanced devices and as these are rich universities, the Wi-Fi facility is also available. Back-up is also available. Teachers also have support. Mobile learning would be embraced easily in those universities. But in government universities, things have to be sponsored and arranged. Introducing mobile learning in public sector universities would be difficult to some extent but it can be applied here as well.' [Uni C - Teacher9]*

A couple of participants considered that, regardless of whether or not they could afford expensive phones, they preferred not to have them because of the risk of theft. They reported that such thefts had occurred in the past.

> *'So, it has a high probability of getting stolen. That is why mostly people prefer to keep a low cost mobile phone and that is also a personal reason that I don't use such things.' [Uni B - Teacher2]*

Eventually, it would be difficult for teachers with less expensive mobile devices, which are based on older technologies and offer limited communication features, to be involved in mobile learning.

Interestingly, the teachers did not express any strong concerns about the cost of the mobile internet or Wi-Fi compared with the student focus groups. For students, one of the major concerns was their having to pay for the mobile internet if they had to use it for browsing learning resources or connecting remotely to the university's learning management system. However, teachers did not show any concerns about these costs.

5.10.1 Cost - Summary of Discussion and Findings

This section provides a summary of the major discussion points and findings regarding the cost of mobile devices for learning.

- Teachers considered the cost of mobile devices as a major obstacle to the implementation of mobile learning in Pakistani universities.

- Teachers expected the university to support or subsidize the purchase of expensive smart mobile devices for teachers and students as the university might save this money in terms of less maintenance being required for computer labs on campus.

- Teachers perceived that private sector universities with a better financial infrastructure and IT facilities are in a better position to test mobile learning initiatives in Pakistan, given the poorer facilities and resources available in public sector universities in Pakistan.

- A few teachers preferred to keep less expensive mobile devices with them at all times as they perceived that there was a risk of theft, probably in their residential area; this would make it difficult for them to engage in future mobile learning.

- Teachers did not show concerns about the cost of the mobile internet although it was one of the major concerns of the students.

5.11 Mobile learning Activities and Applications - Results and Discussion

Teachers in Pakistani universities generally reported mobile learning activities similar to those reported during the students' focus group discussion sessions. However, a few teachers argued that mobile learning activities could introduce some new problems and could reduce the quality of teaching currently being delivered. In general, teachers were excited to share their mobile learning experiences regarding both their personal learning activities and their teaching-related tasks. Upcoming subsections enlist the mobile learning activities and apps experienced by Pakistani university teachers.

Similar to the data analysis for Students' focus groups, coding process was followed to analyze the data from Teachers' focus groups for mobile leaning (refer to the Section 4.10 in Chapter 4 for details). Data analysis of Teachers' focus groups revealed similar patterns to students' focus groups mobile learning activities and application plus teaching activities performed by teachers, therefore certain categories were titled accordingly. For instance, mobile learning activities and applications performed by teachers were divided into four main categories such as administrative activities, collaborative activities, informal teaching and learning activities and learning support activities. Following subsections include detailed information for each of these categories.

The trends represented in the data for teachers' involvement in mobile teaching and learning activities are encouraging due to the reason that these teachers were neither guided nor trained for any mobile teaching and learning activity and application. All of these mobile teaching and learning activities performed by these teachers were

result of their own self-driven initiatives to engage in teaching and learning using mobile devices without realizing the impact or potential of mobile learning into their teaching and learning at university in general.

5.11. 1 Administrative Activities

Some of the mobile learning activities reported by teachers during focus group sessions consisted of administrative tasks such as recording attendance of the students, uploading lecture material for students to access and circulating lecture rescheduling information to the enrolled students. These tasks were categorized as administrative activities performed by teachers of Pakistani universities using their mobile devices. Figure 25 shows the percentages of teachers performing these administrative activities using their mobile devices.

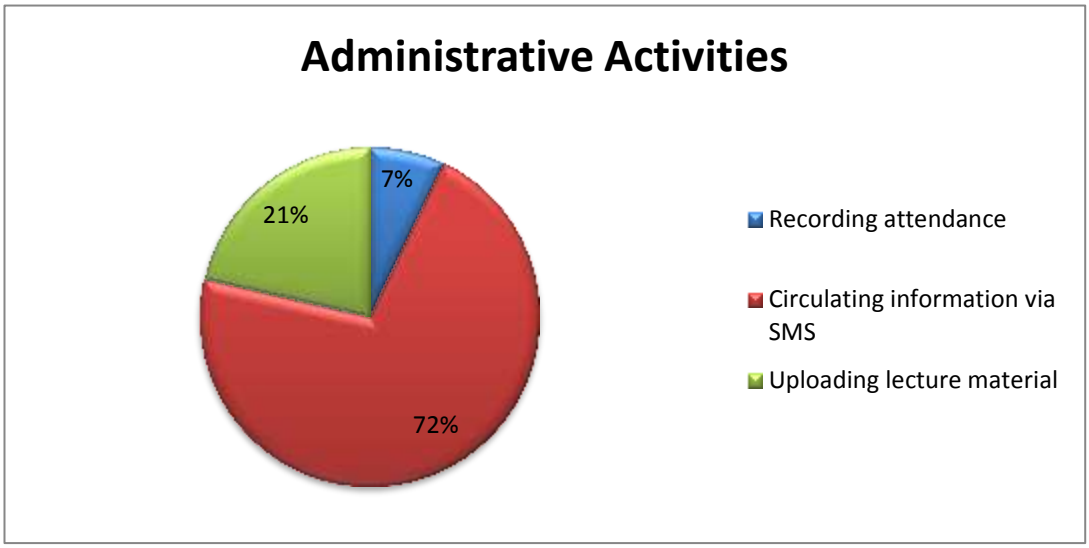


Figure 25: Administrative activities performed by teachers using their mobile devices

Circulating important as well as urgent information amongst the larger cohorts of students using SMS was found the most popular activity among majority of the teachers. Generally, teachers used this method of information dissemination if teacher had to reschedule the lectures or laboratory sessions due to an urgent or emergency matter. In this case, students would not travel to university just for that particular lecture or utilize their time better. Many teachers also used mobile devices

to upload lecture notes or lecture related material to the LMS for students to access on their own time. Only a few of the teachers used mobile devices to record students' attendance.

5.11. 2 Collaborative Activities

Sharing learning resources with students, communication with students and providing feedback for assignments and projects were among the activities categorized as collaborative activities as outcome of the data analysis of teachers' focus groups. Figure 26 displays the data according to the teachers' experiences for certain collaborative mobile learning activities.

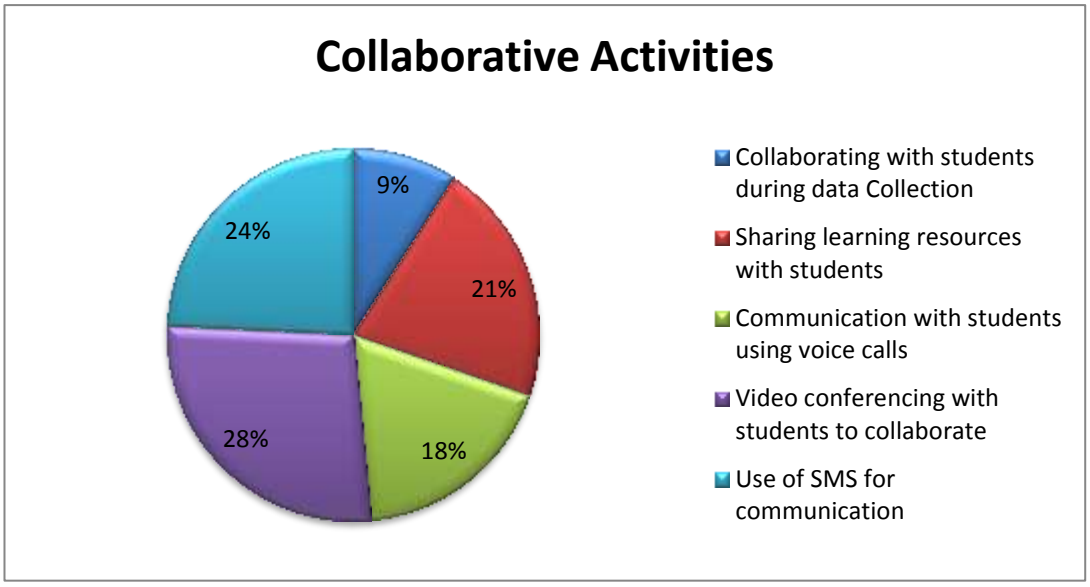


Figure 26: Collaborative activities performed by teachers using their mobile devices

Video conferencing on mobile devices with the students who are usually on field trips to collect data or internships had been used by many teachers. Use of SMS for communication regarding assignments and sharing learning resources with students was also found popular activities among many teachers. Surprising, only a few of teachers stated that they had been collaborating with students during students' data collection trips; however, use of SMS was found popular for similar situations. Communication with students using voice calls was preferred by 18% of the teachers.

5.11. 3 Informal Teaching and Learning Activities

Teachers had been engaged in a number of informal mobile teaching and learning activities including reading eBooks, lecture preparation, note taking, lesson plans, reviewing recorded lectures and preparing instant presentations. Data about informal teaching and learning activities by teachers has been displayed in Figure 27.

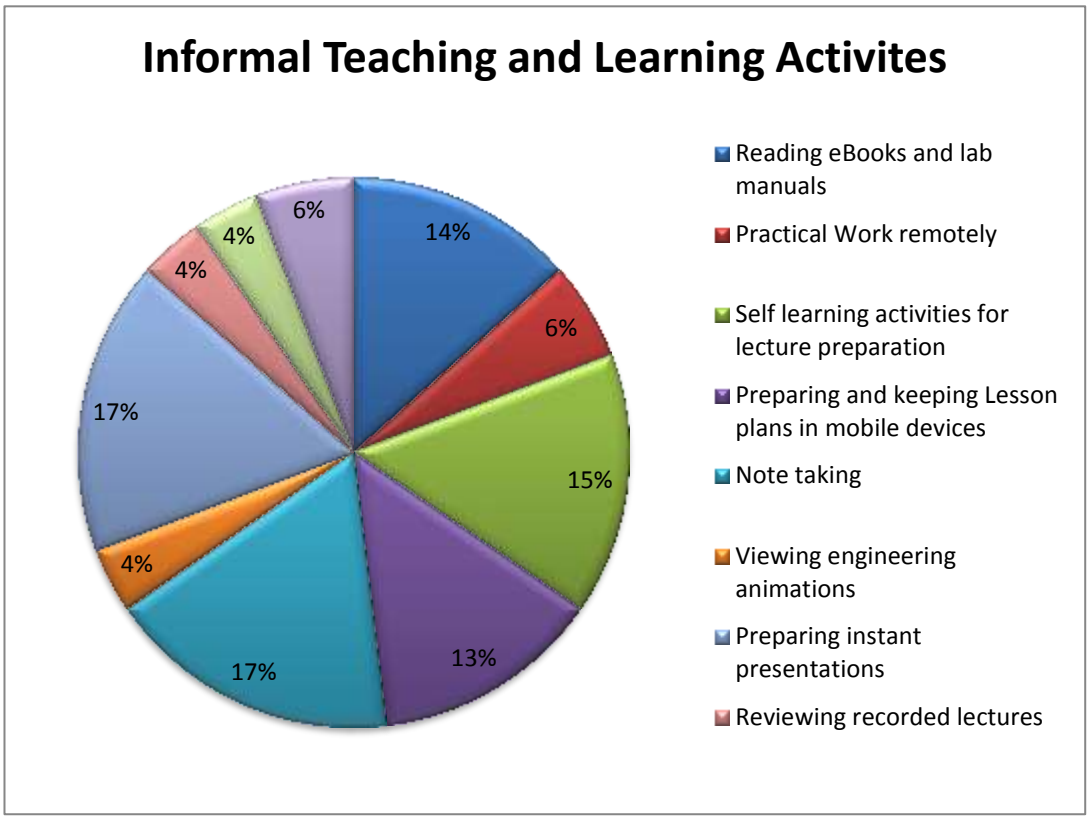


Figure 27: Informal teaching and learning activities performed by teachers using their mobile devices

As compared to the other categories of mobile learning activities discussed earlier in this chapter, this category has fewer teachers involved in a range of informal teaching and learning activities. For instance, reading eBooks, self-learning during lecture preparation, preparing lesson plans, preparing instant presentations and note taking were among the popular activities among 13% to 17% of the teachers. Only a few teachers conducted quizzes on mobile devices or reviewed recorded lectures.

5.11. 4 Teaching and Learning Support Activities

Teachers reported some of the activities which they had been doing to support their teaching and learning using their mobile devices; these activities have been categorized as teaching and learning support activities such as shown in Figure 28.

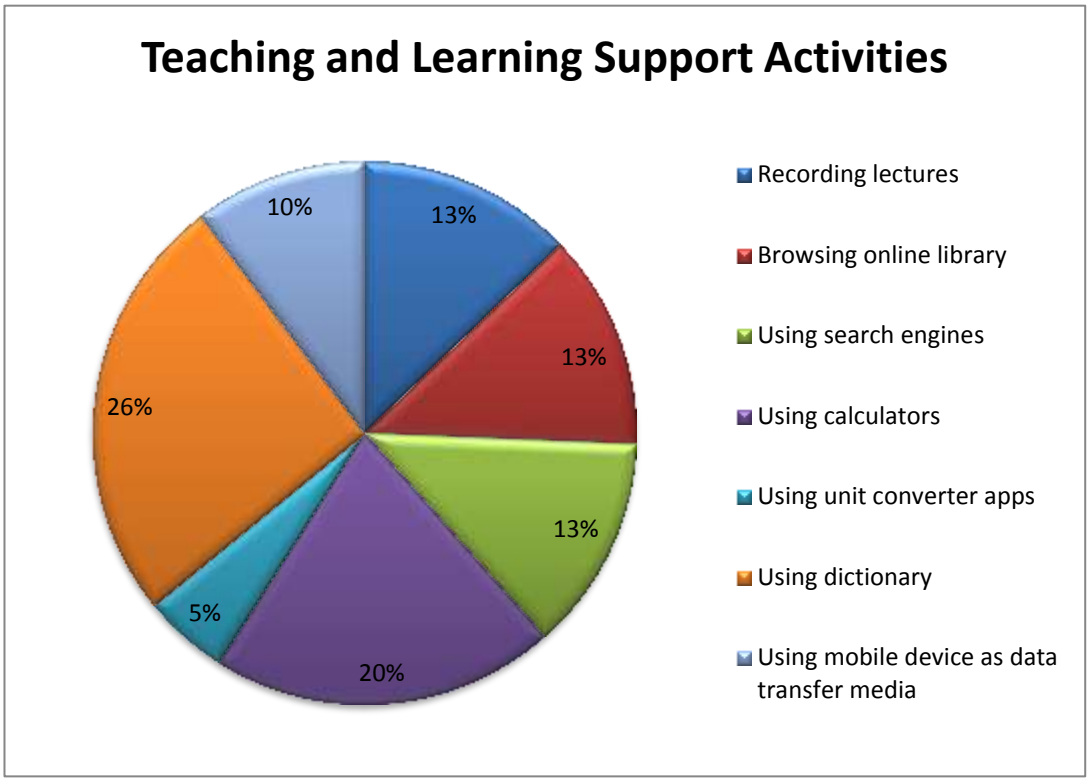


Figure 28: Learning support activities performed by teachers using their mobile devices

Using the dictionary and using calculators were found to be the most popular teaching and learning support activities among teachers. As English is not the first language of Pakistani people but the medium of instruction is English in all of the mainstream universities and higher education institutions in Pakistan, the use of a dictionary has been found to be a very popular teaching and learning support activity among teachers and students. Browsing online libraries, recording lectures and using search engines, were also found moderately popular among the teachers participating in focus groups.

5.11. 5 Mobile Learning Activities by Teachers – Big Picture

All of the four categories of mobile learning activities by teachers have been displayed in Figure 29. Similar to the data analyzed for students' focus groups, majority of the teachers have been involved in informal teaching and learning activities as compared to other types of activities. Teaching and learning support activities were performed by 28% of the participants whereas 24% participants were engaged in collaborative activities. Only a few of the teachers performed administrative activities using their mobile devices.

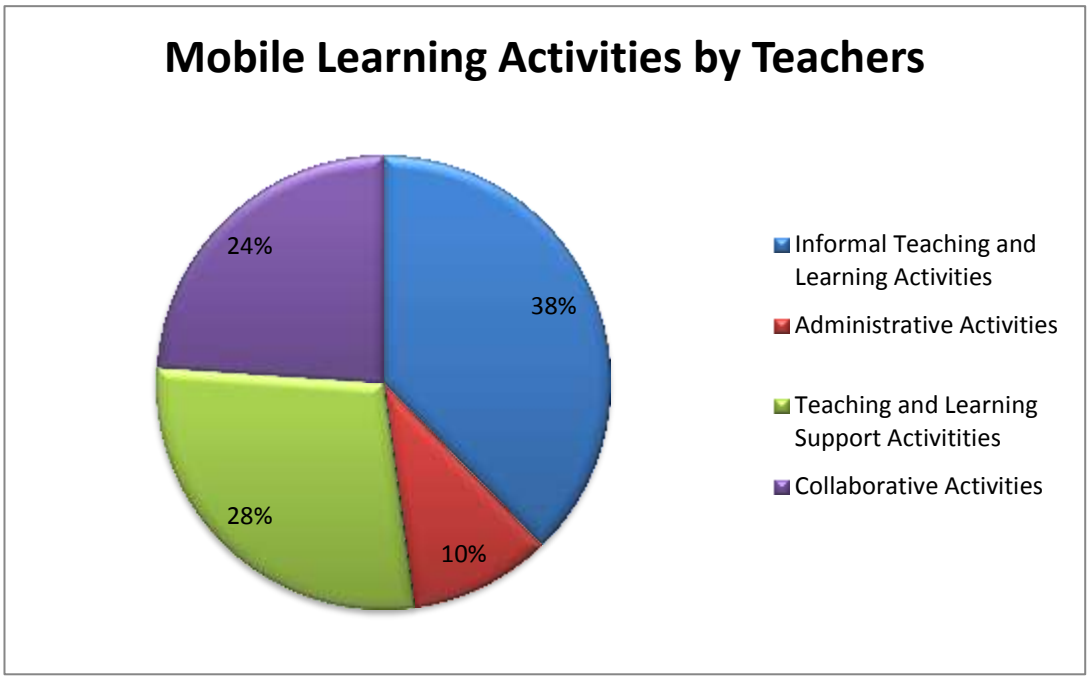


Figure 29: Category wise distribution of mobile learning activities performed by teachers using their mobile devices

As discussed in earlier subsections in this section, teachers have been using mobile devices informally for a number of teaching and learning activities in Pakistani university environments. Most mobile learning activities and applications used by the teachers correspond to the categories of mobile learning activities discussed by Naismith et al. (2004) and Traxler (2009); viz., behaviourist, collaborative, situated,

constructivist, informal and lifelong learning activities. Table 9 highlights the detailed illustration of the categories from this research (Fourth column with italicized text) with the categories presented in Naismith et al. (2004, 18) (First three columns with non-italicized text).

The majority of the mobile teaching and learning activities and applications reported by teachers in the focus groups were found similar to what has been reported in the literature. However, the categorization of the mobile learning activities developed in this section has been informed by the results of data analysis of this research that makes it a key contribution of this research to the mobile learning literature.

Table 9: Mapping of categories of mobile teaching and learning activities from this research with the themes by Naismith et al. (2004) (Adapted from: Naismith et al. (2004, 18)

Theme	**Key Theorists**	**Activities**	***Categories of Mobile Teaching and Learning Activities from this research***
Behaviourist Learning	(Pavlov 1927; Skinner 1968)	Drill and feedback classroom response systems	*Collaborative Learning Activities* *Informal Teaching and Learning Activities*
Constructivist learning	(Bruner 1966; Papert 1980; Piaget 1929)	Participatory simulations	*Collaborative Learning Activities*
Situated learning	(Brown, Collins, and Duguid 1989; Lave and Wenger 1991)	Problem and case-based learning context awareness	*Informal Teaching and Learning Activities*
Collaborative learning	(Vygotsky 1978)	Mobile computer-supported collaborative learning (MCSCL)	*Collaborative Learning Activities*
Informal and lifelong learning	(Eraut 2000)	Supporting intentional and accidental learning episodes	*Informal Teaching and Learning Activities*
Learning and teaching support	n/a	Personal organization support for administrative duties (eg attendance)	*Teaching and Learning Support Activities, Administrative Activities*

A number of mobile teaching and learning activities reported by the teachers participating in the focus groups were also found in mobile learning literature. For instance, many popular learning activities among teachers in Pakistani universities such as using SMS for announcements and communicating to students, uploading lectures, preparing lesson plans and learning English as second language were also discussed by Petrova (2010), Kwon and Lee (2010) and Cavus and Ibrahim (2009).

Furthermore, sharing learning resources, using particular course-related applications such as unit convertors for engineering courses, recording lectures and browsing library resources were also mentioned by numerous studies in mobile learning literature (Akhshabi, Khalatbari, and Akhshabi 2011; Becta 2008; Deng et al. 2005; Eschenbrenner and Nah 2007; Green, amp, and Hannon 2007; Kukulska-Hulme 2010; Kurti, Spikol, and Milrad 2008; Lan and Sie 2010; Ogata et al. 2008; Wang et al. 2009). The majority of the activities related to teaching and learning using mobile devices experienced by Pakistani university teachers were available in these literature references but this research contributes to the mobile learning literature by categorizing these mobile teaching and learning activities with respect to the particular themes.

Besides reporting positive experiences, some teachers expressed their concerns that mobile learning might compromise the quality of teaching which could be delivered to students by the teacher's presence in the classroom.

> *'Yes, I do! You are right but some of our courses require mandatory presence of students and the teacher.' [Uni A - Teacher2]*

Comments from one teacher showed a reluctance to adopt mobile learning despite acknowledging the importance and usefulness of mobile learning.

> *'Yes, SMS and videos may be used. But I have a good memory for lecture material. I am not using mobile devices for learning currently.' [Uni A - Teacher7]*

One teacher said that he would be happy to be involved in mobile learning activities if there would be any trial implementation in the future. Another teacher expressed

the view that he would be involved in mobile learning if appropriate training and support were provided to teachers. Teachers also were concerned that students and teachers might exploit mobile learning facilities and resources; they recommended that the university, by establishing protocols and policies before the implementation of mobile learning, should ensure that such exploitation would not occur.

> *'We will welcome this but in a disciplined way.' [Uni B - Teacher5]*

> *'Yes, I will be provided that – with support or training which we discussed before. Moreover, there should not be any misuse of these facilities.' [Uni B - Teacher4]*

Hafeez–Baig et al. (2013) also argue that mobile learning initiative in university environments needs to be managed and sustained carefully to make it suitable for all stakeholders in teaching and learning, in particular the students and teachers.

5.11.6 Mobile learning Activities and Applications: Summary of Discussion and Findings

This section provides a major point summary of discussion and findings regarding the mobile learning activities and applications experienced by the teachers:

- Mobile learning activities and applications reported by the teachers were divided into four categories such as administrative activities, collaborative activities, informal teaching and learning activities and teaching and learning support activities.

- Categories of mobile learning activities and applications developed in this study correspond to the categories of mobile learning activities by Naismith et al. (2004) such as behaviourist, collaborative, situated, constructivist, informal and lifelong learning activities.

- Informal teaching and learning activities using mobile devices were found to be the most popular category amongst the teachers.

- It was observed that teachers were apprehensive that the introduction of mobile learning might undermine the role and importance of teachers in the university learning environment.

- Teachers stated that they would welcome the introduction of mobile learning to their teaching and learning practice if it were launched in an organized manner.

5.12 Socio-Cultural Factors - Results and Discussion

Similar to the students' focus groups discussion, teachers from Pakistani universities asserted that there were a few important aspects which particularly need to be looked at and evaluated before attempting to include mobile learning into mainstream university education. Data analysis of the teachers' focus group discussions revealed that these aspects indicate the social-economic and socio-cultural pointers of a typical developing country society. A number of points concerning the socio-economic circumstances of some stakeholders have been mentioned in Chapter 4 and in the Connectivity, Traning needs' and Cost related sections (5.7, 5.9 and 5.10) earlier in this chapter. However, the need for creating awareness, enhancing motivation for mobile learning, and possible negative uses of mobile learning resources are a few of the factors which emerged from the data collected for this research. The following sub-sections highlight the perceptions and expectations of teachers in Pakistani universities regarding the social, economic and cultural norms which might influence the potential implementation of mobile learning in formal teaching and learning environments in universities. Further, findings from the analysis of data gathered from the teachers' focus group discussions confirmed the findings from the students' focus groups for these socio-cultural factors.

5.12.1 Awareness

During the focus group sessions, a number of teachers highlighted an important issue regarding the introduction of mobile learning in Pakistani university environments. They argued that raising the awareness and understanding of the benefits of potential of mobile learning on a large scale among all possible stakeholders would be the best way to initiate any implementation of mobile learning in Pakistani university

environments; they warned that mobile learning might be misunderstood and misused if people were not made aware of ethics or trained to use mobile devices appropriately in education.

> *'I think mobile learning norms and ethics need to standardize and people should be trained for that. In Pakistan, people tend to misuse resources.' [Uni B - Teacher8]*

> *'I just want to say that I agree with Uni B-Teacher8 that we must first spread awareness of this because this can be highly misused.' [Uni B - Teacher7]*

One teacher highlighted the importance of establishing and adhering to regulations and standards regarding the use by teachers and students of copyrighted material on the internet. This should be done prior to launching mobile learning trials. In the case of mobile learning, both teachers and students might be downloading a substantial amount of educational resources and apps from the internet, in which case the sources must be acknowledged appropriately according to academic ethics to avoid copyright, plagiarism and academic misconduct in general.

> *'Every industry has its own ethics to uphold. We will opt for taking something from the internet and showing it to our students. What if they are patented and we have to register ourselves first? Then what are we supposed to do? So, after following all ethical codes we will be able to focus on the application of these features.' [Uni B - Teacher5]*

Another teacher suggested using mobile devices to create short movies (for an awareness campaign about mobile learning) to show the benefits and challenges of mobile learning and spread the word. The awareness campaign videos could be downloaded onto students' and teachers' mobile devices. In this way, they would better understand how a mobile device could add flexibility to their teaching and learning.

> *'If we speak of documentary movies for its awareness, even they will be showed to us via the same mobiles.' [Uni B - Teacher10]*

In the mobile learning literature, very few researchers considered the issue of creating awareness about mobile learning prior to its introduction into the learning environment (Alzaza and Yaakub 2011; Kumar et al. 2010; Sife, Lwoga, and Sanga 2007). However, no particular study appears to have considered the importance of making teachers aware of the potential uses and benefits of mobile learning. According to the participants in this study, it was a matter of the utmost importance to raise the awareness of mobile learning among the teaching and learning community. According to focus group participants, teachers and students should be made aware of the benefits that mobile learning has to offer, together with an awareness of appropriate protocols and policies in order to prevent misuse (e.g., plagiarism, academic misconduct). Moreover, appropriate and adequate training should be provided to both teachers and students, if the implementation of mobile learning is to succeed.

5.12.2 Motivation

Teachers participating in the focus groups talked about students' motivation regarding mobile learning as well as their own motivation to be involved in mobile learning activities. One teacher believed that the majority of the students would be excited and motivated to try mobile learning initiatives in the future. The teachers suggested that it would be ideal to introduce mobile learning activities by blending them with existing learning modes.

> *'I think that not every student is capable of doing things independently. Some students are self-motivated to learn by themselves. There are some students who learn with the help of the teacher. And the third type of student is the one who won't study even if a teacher forces him to study. But the point here is motivation. If someone wants to work, he can do so. In my experience, 80 students among 100 would be self-motivated, 10 will start study with some guidance but there will also be 10 students who wouldn't study even if they are guided or forced.' [Uni A - Teacher8]*

The participants also discussed their own level of motivation regarding their involvement in mobile learning. They reported that mobile learning assisted them to

find information and learn things instantly when they needed it. For instance, when encountering difficulty or uncertainty when preparing a lecture, teachers can quickly check a dictionary or encyclopaedia on their mobile devices. In this way, mobile learning increased their motivation, providing them with flexible and instant access to a variety of learning resources online and offline.

> *'There is another important point; I think every individual's motivation level is different at different times of the day. If you are preparing something for the lecture purposefully, you are motivated at that time to learn things quickly and instantly. At this point of time, mobile learning is very useful and spot on.' [Uni A - Teacher4]*

> *'Sometimes it happens to me. If I am studying something and want to know more about some concept, at that time I am motivated and determined to learn it. If I have the mobile internet facility, then I will use it. However, if I missed this time, I may not go for it later on because of less motivation or I will forget it.' [Uni A - Teacher8]*

A few participants were concerned about using their personal time after office hours to reply to students' SMS, emails, discussion groups or information sharing requests on social networking groups. They stated that their personal space and time would be disrupted. This concern could be addressed by setting rules to differentiate between academic queries or social engagement in reference to responding to students via mobile devices. Also, they were concerned that this extra assistance given to their students outside normal university hours, in fact, would be unpaid overtime. The university might not acknowledge the additional time spent assisting students in the mobile learning mode. Hence, mobile learning may well add to their existing workload. This fear discouraged them from engaging in future mobile learning activities in the university environment. It seemed that more teachers would be motivated to be involved in mobile learning initiatives in the future if the university acknowledged the time they spent out of the office hours by reducing their normal teaching workload or paying them extra for the after-hours time spent responding to students' queries.

'What if the teacher is not motivated to use mobile learning?' [Uni A - Teacher1]

'Then he would be sleeping by switching off his mobile.' [Uni A - Teacher2]

'There are few teachers who say this is the class time, learn here whatever you want, and refuse to help later on.' [Uni A - Teacher3]

'But we are talking about the motivated teachers here.' [Uni A - Teacher4]

'If he is questioned, he could say that it is not the time for work, and also he is not paid for this.' [Uni A - Teacher5]

'Officially, it is not possible that a teacher is not paid for answering the questions of students after class time.' [Uni A - Teacher7]

'I would only do all these activities if I were being paid more.' [Uni A - Teacher5]

'Students only post questions online or email to those teachers whom they know will reply to them.' [Uni A - Teacher4]

A number of teachers discussed the notion that putting too much restriction on students' use of the mobile internet or Wi-Fi would decrease their motivation to be involved in mobile learning initiatives. Designing mobile learning activities which let the students work more independently would work better. Also, students might enjoy social networking and other entertainment activities (except unethical ones) along with learning tasks. Students would not be interested in mobile learning if their university blocked all entertainment sites and permitted the downloading of learning resources only. This mode of relaxation would help them to work more independently and they would be self-motivated to embrace mobile learning.

'There are two things in it. Firstly, there should not be many restrictions on what students can do or what they are not allowed. University students are mature enough to distinguish what they should do or avoid. Secondly, you

assign them a task and give them a deadline; it is their choice whether they do it while having music On or Off; they should enjoy working, not be forced. I mean you cannot say that they can watch YouTube for learning and not watch any other entertainment-related video at all.' [Uni C - Teacher2]

'Yes! Exactly. As long as he is doing the task and meeting deadlines, we should not bother about other entertainment activities.' [Uni C - Teacher1]

'Yes! Exactly. There should be an element of enjoyment.' [Uni C - Teacher8]

In mobile learning literature, a number of researchers have associated students' enhanced motivation with the availability of engagement in teaching and learning via mobile devices (Barker, Krull, and Mallinson 2005; Fernandez, Simo, and Sallan 2009; Rau, Gao, and Wu 2008; Ruchter, Klar, and Geiger 2010; Savill-Smith 2005). However, only a few researchers have touched upon the topic of how mobile learning might increase teachers' involvement in and motivation for teaching and learning (Sørebø et al. 2009). Therefore, this is another gap in mobile learning research literature; viz., the effect of mobile learning options on the teachers' levels of motivation and engagement in teaching and learning in general. This research takes into consideration the teachers' perception of the extent to which they felt more motivated during lecture preparation and lesson plans with the instant access of learning resources using mobile devices; also, how mobile learning might decrease teachers' motivation to be involved in mobile learning if the extra time that they put in for the purpose of mobile learning outside normal university hours is not acknowledged by the institution.

5.12.3 Negative uses

the teachers participating in the focus groups pointed out a number of negative aspects or risks associated with the introduction of mobile learning in Pakistani university environments. They mentioned that students could use mobile devices for cheating in the examinations and classroom quizzes; they could save eBooks in their devices and use these during examinations or when tackling quizzes inside the classroom. The only solution to this problem would be to place strict guidelines with

the use of mobile devices from the examination venue. Some teachers suggested turning on mobile phone signal jamming devices for the duration of an examination as a solution to the possible cheating issue.

> *'There are certain mobile devices in the market these days on which you can save an entire book. And if the books are saved, then neither cellular signal jamming equipment would work nor anything else and they can open it whenever they want as it could be used offline. There is no need to connect to internet if you have already downloaded and saved a book in your mobile device.' [Uni C - Teacher2]*

> *'You can take a picture of the whole page by focusing on it and zooming it to read.' [Uni C - Teacher8]*

Another negative aspect experienced by the teachers was that students play games or send texts during the lecture or tutorial discussion sessions inside the classroom. Students may not take part in the classroom activities or listen to the lecturer if they were allowed to use mobile phones in the classroom. One teacher suggested involving students with mobile learning activities or quizzes to make productive use of their time spent with the mobile devices inside the classroom.

> *'Apart from this, I've seen that during classes students are not paying attention to the teacher but are playing games on their mobiles.' [Uni B - Teacher5]*

Also, the majority of the teachers suggested turning on jamming devices to solve any negative use issues in mobile learning. However, one teacher revealed that jamming devices also block internet signals and Wi-Fi signals in the vicinity. Hence, other members of the university community would be inconvenienced. One teacher suggested that the most appropriate solution would be to educate students about the ethics, terms and conditions of signing up for the mobile learning mode.

> *'But this is not the right solution. We have to correct our students' habits and we need to adopt a different way for that. Like you said earlier, we have*

to use their time spent with mobile devices and use it for learning.' [Uni B - Teacher9]

One participant blamed the sudden growth of the IT and telecommunication sector in Pakistan and considered that people were not educated about the ICT exposure prior to its use. Teachers reported that the majority of the students did not bother about receiving calls during the lecture. They believed that students, even in universities, are not educated about the etiquette and ethics of using ICTs in an appropriate manner. The teachers stressed the fact that people should be educated and made ready to embrace mobile learning by training them in the ethical use of ICTs and other university resources.

'Actually the problem is that our communication and especially our IT have increased similar to a quantum jump. Other countries have seen a continuous development and so have the inhabitants' social habits. The majority of people were exposed to the devices and technologies which they were not ready for and this has affected our social norms greatly. We did not face a gradual exposure to these things and that is why we face problems in the classrooms as well. For example, you're delivering a very important point of a lecture and a student gets a call; he leaves the class and everyone's attention is diverted towards him.' [Uni B - Teacher2]

'Yes, there's a lot of interruption because of this and I've seen that if in a one-and-a-half hour lecture this happens 8-10 times, you are not able to cover your topic completely. Whereas in a developed country, a teacher doesn't have to tell the students to switch off their cell phones before the class starts. It's understood that they have to switch off their mobiles in the class and they're not supposed to receive any calls or they have to keep their phones on silent. But here, people don't have that mental maturity. Therefore, firstly, people should be prepared for this.' [Uni B - Teacher1]

The teachers reported that students sometimes recorded the lecture and uploaded their *favourite part* on YouTube without permission from the teacher, where the teacher might be joking in the class or without context of the discussion. Such

actions might harm the reputation of both the lecturers and the university. In Pakistani's cultural environment, it would also be unacceptable for students to film their female teachers and upload the video on YouTube.

> *'Yes, one of my students uploaded my lecture on YouTube without my permission. There are times when you are joking with the class or speaking in a particular context and students don't record what you previously spoke, rather what benefits them. They can exploit teachers in many ways.' [Uni B - Teacher5]*

> *'Female teachers, especially, don't always benefit from the video recording of lectures.' [Uni B - Teacher3]*

> *'Students don't upload the entire recording but only their favourite part.' [Uni B - Teacher5]*

There were two more concerns discussed by the participants regarding the negative uses of mobile devices in the case of future implementation of mobile learning. Firstly, students might obtain recorded lectures and not attend face-to-face lectures at all. Secondly, for collaboration purposes, teachers might need to share their mobile phone number with students; students might misuse this information and keep annoying teachers by sending bulk SMS or other information overload.

> *'I have a concern in case mobile learning is introduced. Students would not bother to attend lecturers as they can access their lecture from anywhere and their presence in the classroom is no longer necessary.' [Uni B - Teacher5]*

> *'Junk messages are one of the drawbacks which we can have – others are all plus points – is our habitual sending of junk messages to the people. I mean spamming people with unwanted messages.' [Uni B - Teacher2]*

In mobile learning literature, a number of researchers have taken into account the potential risks and challenges of implementing mobile learning at the higher education level in developed countries (Gregson and Jordaan 2009; Hashemi et al. 2011; Maria et al. 2008; Mohamad 2012). Similarly, research studies of mobile

learning in developing countries also point out the risks and challenges associated with the introduction of mobile learning in different learning environments and levels in these countries. Many potential challenges and risks associated with the future implementation of mobile learning in Pakistani university environments mentioned by the participants of the focus groups confirm what has already been said in the mobile learning literature, particularly for developing countries, including lack of awareness, students' socio-economic backgrounds and their knowledge of professional ethics (Adesope, Olubunmi, and McCracken 2007; Lalji and Good 2008; Sari and Tedjasaputra 2008; Sife, Lwoga, and Sanga 2007).

There are several potential risks mentioned by Pakistani university teachers that have not been found elsewhere in the literature such as video recording without the teacher's permission and spamming teachers with bulk SMSs if they share their mobile number for learning purposes. Indirectly, these problems are associated with lack of awareness and professional ethics of using mobile devices within learning environments. These issues could be addressed by an awareness and training campaign prior to future introduction or implementation of mobile learning in Pakistani university environments.

5.12.4 Socio-Cultural Factors - Summary of Discussion and Findings

This section provides a summary of the main discussion points and findings regarding the teachers' perceptions and expectations of socio-cultural factors:

- Teachers in Pakistani universities participating in this study considered it very important to create an awareness of the benefits of mobile learning in the teaching and learning community in Pakistani universities prior to its formal introduction into the learning environment. An appropriate awareness campaign or training seminar would serve this purpose adequately.

- Teachers suggested that an awareness campaign be launched prior to the introduction of mobile learning. Short video clips could be made showing the mobile learning mode, and downloaded on the mobile devices of both teachers

and students. In this way, they learn about mobile learning by experiencing mobile learning.

- Teachers stressed the importance of making students aware of academic misconduct and use of copyrighted material available on the internet which would be at their fingertips if they were involved in mobile learning in a formal teaching and learning environment.

- Teachers indicated that students were more motivated to learn in the case of mobile learning.

- Teachers suggested that their motivation level was increased during the lecture preparation with the availability of instant access to learning resources.

- A few teachers argued that their motivation level would be negatively affected by mobile learning as they would be disturbed by students contacting them during their private time and space.

- Teachers were concerned about being demotivated if their extra time were not included as part of their official workload.

- Teachers felt that students' motivation for learning with mobile devices would be increased if they were provided with less restricted the mobile internet access.

- Mobile learning literature talks about students' motivation associated with mobile learning; however, teachers' motivation in terms of mobile learning has not been discussed to any extent by mobile learning researchers.

- Teachers mentioned a number of possible risks and challenges associated with the future implementation of mobile learning in Pakistani university environments such as lack of awareness, lack of knowledge of professional ethics, video recording without teacher's permission and spamming teachers with bulk SMS if they share their mobile number for learning purposes.

5.13 Chapter Summary

In general, teachers in Pakistani universities participating in the focus group discussion sessions for this research were open and positive about embracing mobile learning in their teaching and learning. To some extent, they had experienced mobile learning informally by collaborating with their students for projects and assignments, communicating with students using SMS and sharing information with students by means of emails, yahoo groups and other social networking channels. Teachers have also been experimenting with mobile learning for their own learning and teaching using a number of mobile learning activities and applications. They did not have much awareness about the benefits of mobile learning across multiple contexts. They wanted mobile learning to be offered in a blended learning environment where a teacher can continue to play an important role in the students' learning journey. Cost did not matter much to the teachers; however, they reflected on the costs incurred by students involved in formal mobile learning. Teachers were eager for mobile learning to be introduced in Pakistani university environments despite issues relating to cost and connectivity. A number of points were discussed regarding the socio-cultural aspects of the society of a developing country such as argument for running an awareness campaign among the stakeholders of Pakistani university environments prior to any mobile learning initiative. Teachers also pointed out several risks associated with future implementation of mobile learning in Pakistani university environments. A summary of findings from the anlaysis of teachers' focus groups sessions have been presented in Figure 30 on the next page.

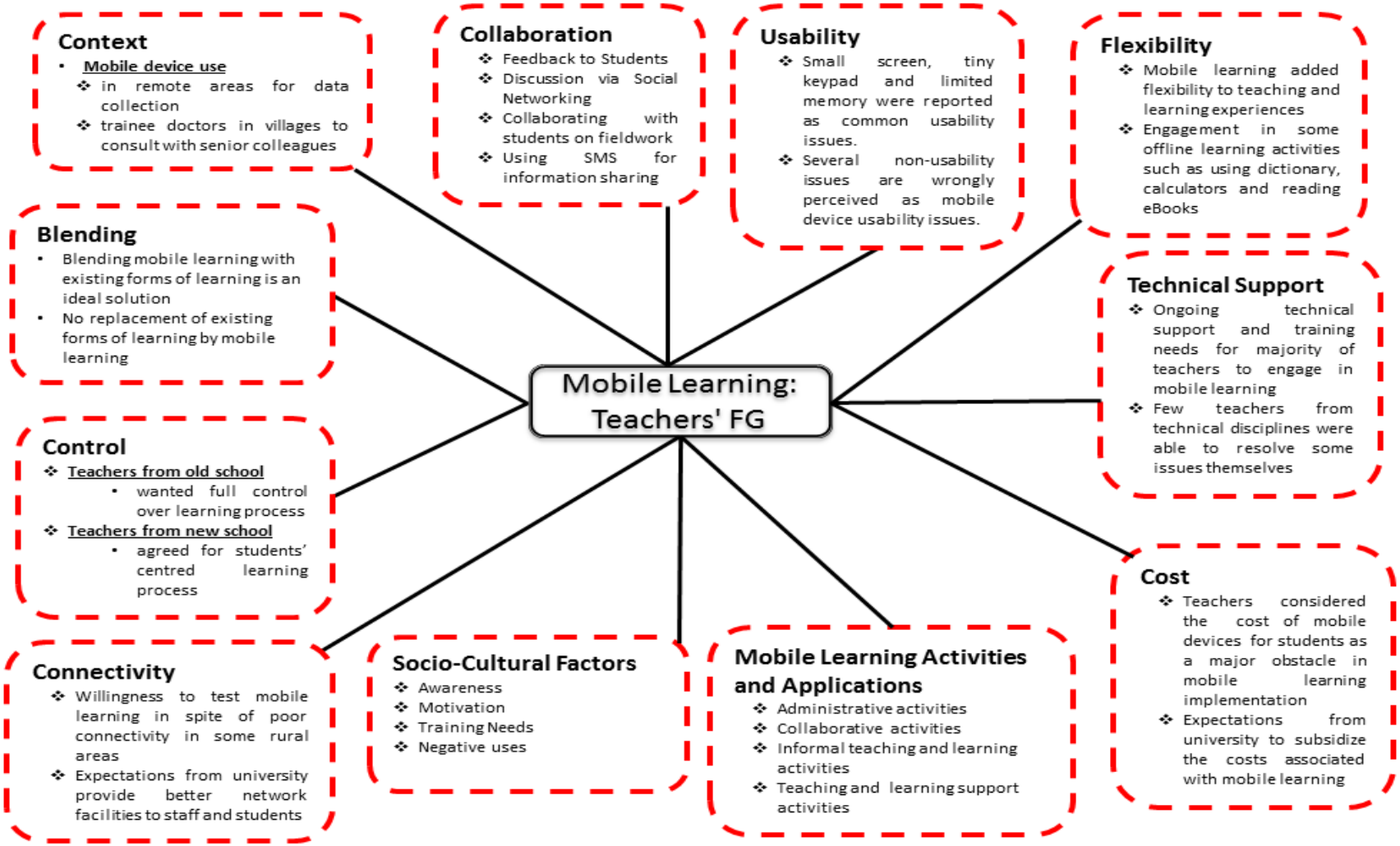


Figure 30: Summary of findings from Teachers' Focus Group sessions

CHAPTER 6 ADMINISTRATIVE STAKEHOLDERS' INTERVIEWS: RESULTS, DISCUSSION AND FINDINGS

6.1 Introduction

In this chapter, results, discussion and findings from the analysis of individual semi-structured interviews with administrative stakeholders from Pakistani university environments are presented. The stakeholders include IT managers, instructional designers and administrators holding policy making roles on senior positions.

During the process of data analysis using Nvivo software (as detailed in section 3.6.4 in chapter 3), many of the themes individually discussed in Chapter 4 and Chapter 5 have been combined in this chapter. Furthermore, the administrative stakeholders discussed some of the issues with inter-related themes, leading to a strong relationship between different themes. This resulted in synthesizing the data in the form of relationships among those themes. For instance, collaboration was discussed in relation to students and teachers being in different places; therefore, during the data analysis and write-up stages, collaboration and context were combined.

Similarly, several other themes such as usability, technical support and training needs of the teachers and students, were discussed together. Interestingly, for some of these combinations such as collaboration and context, mobile learning literature supports this combination. Details of particular themes discussed differently in Chapter 4, 5 and 6 have been provided in Table 10.

Table 10: Details of Themes differently discussed in Chapter 4, Chapter 5 and Chapter 6

Chapters / **Themes**	**Chapter 4**	**Chapter 5**	**Chapter 6**
Collaboration	Discussed individually	Discussed individually	Combined and discussed together
Context	Discussed individually	Discussed individually	
Usability	Discussed individually	Discussed individually	Combined and discussed together
Technical Support	Discussed individually	Combined and discussed together	
Training needs	Not Discussed		
Connectivity	Discussed individually	Discussed individually	Combined and discussed as Usage and Connectivity
Awareness	Discussed individually	Discussed individually	Combined and discussed together
Motivation	Discussed individually	Discussed individually	

Another important consideration is related to confirmation of many of the findings from students' focus groups in Chapter 4 and teachers' focus groups in Chapter 5. The analysis and discussion of administrative stakeholders' interviews confirmed many of the experiences, concerns, perceptions and expectations of students and teachers. However, different perspectives were also presented by policy makers and IT managers in terms of infrastructural facilities and possible future implementation of mobile learning in Pakistani university environments. For instance, IT managers cited numerous facts and figures relating to the network connectivity and other IT facilities available to students that appeared to contradict the students' perceptions of ICT facilities available to them in universities. Similarly, administrative stakeholders were cautious when discussing mobile learning initiatives, particularly in terms of policy changes, major infrastructural upgrades or provision of ICT equipment to teaching and learning communities within the university environments. The following sections of the chapter highlight a number of issues that emerged from the analysis of interviews with administrative stakeholders in Pakistani university environments.

6.2 Collaboration and Context - Results and Discussion

In mobile learning literature, several researchers have associated collaboration with context (Patten, Arnedillo Sánchez, and Tangney 2006; Smordal and Gregory 2003; Spikol, K., and M. 2009). Collaborative learning activities often take place using mobile devices when collaborators are in different contexts and locations. During the interviews with administrative stakeholders from Pakistani universities, the majority of the interviewees talked about collaboration using mobile devices with respect to multiple contexts of collaborators such as students on fieldwork, internships, or remote villages for dental clinics collaborating with teachers using mobile devices. Therefore, these two characteristics have been discussed in combination, given their strong association.

Instructional designers from Pakistani universities made positive comments about using mobile devices for collaboration among students, peers and teachers. They thought it was already happening informally to some extent between students and teachers as well as among students for the purposes of group work. However, collaboration via mobile devices could also be embedded into a formal learning environment, particularly for the courses which require students to work with their peers and consult with their teachers remotely in situations such as fieldwork, group projects or assignments, internships and data collection activities. Some comments that were made by the group are:

> *'Yes, definitely, we use it all the time for this kind of collaboration. For example, I have told you that we developed a mobile ticketing app; we also collaborated for that project and tested it on mobile devices as well.' [Uni A - Instructional Designer]*

> *'A mobile device is a kind of digital teacher or facilitator and will help students in continuous interaction for their guided learning in the field.' [Uni C - Instructional Designer]*

> *'In case of fieldwork, mobile communication is more useful. That is true because mobile phones can be used for taking pictures and making videos of objects of interest.' [Uni B - Instructional Designer]*

The literature supports these findings from Pakistani universities regarding the use of mobile devices for informal collaboration in teaching and learning environments. For instance, Mac Callum (2008) has experimented with informal collaboration using a web-based discussion board accessible via mobile devices by all of the participants. Kurti et al. (2008) tested mobile device-based collaborative learning activities such as finding specific types of trees and exploring the city from a historical perspective, undertaken by school children and found that students enjoyed learning in this manner.

In spite of being positive about collaborating through mobile learning, the instructional designers participating in this research from three universities had some concerns about the students' collaboration from the fieldwork location or data collection site. For instance, one of the instructional designers stated that the teachers could allow the students to collect data via mobile devices, but warned that students should not conclude their study results during data collection in lieu of their virtual collaboration with teachers remotely. For example, students could collaborate with teachers for advice on initial data and issues during the data collection but should not conclude their data analysis or finalize study results until they have detailed consultation with their teachers.

> *'They can collect additional information from the excursions; however, I would say it [is a] mere helping tool not [as] a guide. For example, they can get snapshots and tabulate their initial data but they need to consult with teachers if they have to draw a conclusion based on their data collection and analysis.' [Uni C - Instructional Designer]*

Another concern voiced by one of the instructional designers was that students might misuse the shared space for collaboration and discussion associated with group work by engaging in informal and personal communication. Students might exploit the collaboration opportunity negatively and create a troublesome situation for the concerned teachers by sending too many messages or calls. All of the instructional

designers wanted to establish certain rules and monitoring policies for collaboration and communication among staff and students as well as among students themselves.

> *'This is one of my concerns -; students may indulge in other activities or informal communication within discussion forums instead of focusing on reading materials and other learning tasks.' [Uni A - Instructional Designer]*

> *'It is true that using mobile phones improves communication between teachers and students; however, excessive communication may be undesirable. For example, if allowed, every student will call the teacher or send him an SMS before submitting an assignment. Due to the large number of students, it will not be possible for a teacher to respond to all of them.' [Uni B - Instructional Designer]*

Other than instructional designers, stakeholders from university leadership groups such as Deans of faculties and Heads of Department have also been asked to comment on the use of mobile devices for collaboration between teachers and students in multiple contexts. University administrative stakeholders strongly agreed that the university learning environment could potentially benefit by harnessing the power of mobile devices to enhance collaboration within the teaching and learning community. Moreover, they agreed that this technology could provide continuous learning support to the students who are undertaking fieldwork, internships and data collection activities away from campuses. A variety of data collection activities including those discussed by Pakistani university administrators have been found in mobile learning literature (Barak, Harward, and Lerman 2007; Parr, amp, and B. 2004; Song 2011, 2008).

> *'Yes, our students go for internships in industries; they can share their experiences with each other using their mobile devices. Further, they can present their findings remotely with their colleagues and teachers back in the university or upload their presentations and daily reports in the university's learning management system where it may also be a part of a repository for teachers to examine and for future students to refer to.' [Uni B - Administrator]*

The Dean of the Medicine and Dentistry Faculty at University C stated that they had already been running a pilot project to test the satellite clinics whereby graduate students could go to remote villages and collaborate with their colleagues and professors on campus to discuss particular diagnoses by video conferencing or by sending pictures of patients' dentures as multimedia messages using their mobile devices.

> *'Definitely, students would make use of mobile learning when they are away from their teachers. In this area, we are already setting up Satellite clinics in our rural areas where a general dentist would go over there and if he has any problem with the management of a particular patient, he can take a picture with his mobile device and send it to a secondary care hospital in the city. Or he can use a video conferencing facility to discuss the issue with other colleagues remotely and consult. Further, mobile learning can be used by community dentistry fieldworkers. They could consult with their colleagues remotely if they see any problem regarding the pathology of a particular patient.' [Uni C - Administrator]*

Use of mobile devices for collaboration by medical students has been frequently tested and documented in mobile learning literature (Albrecht et al. 2013; Garrett and Jackson 2006; Johnston et al. 2004; Luanrattana et al. 2010; Mulliah and Stroulia 2009).

University administration stakeholders also mentioned several concerns and issues in relation to the use of mobile devices for collaboration and data collection purposes. An administrator from a medical university mentioned that there were mobile network coverage issues in the remote villages; whereas the Dean of the Engineering Faculty from another university believed that some private engineering firms might not allow students to use their mobile devices to take pictures of the objects or film a video for reasons of privacy protection. Some of the comments are:

> *'At the moment, these projects are in the planning and pilot phases where our house surgeons and field workers are participating. We are handling connectivity issues at this stage so that the implementation phase will be successful.' [Uni C - Administrator]*

> *'This would be beneficial; however, engineering firms do not want their private data including their business logic to be available publicly, and this might be a problem for students who enter there with such a technology at their disposal to share their experiences with other students. Capturing videos as data collection is a very common and popular method among our students already. It can be possible to include it in a formal learning environment; however, there might be data security and privacy issues for private engineering firms.' [Uni B - Administrator]*

Concerns about network connectivity and coverage in remote areas have also been reported in the mobile learning literature (Denk, Weber, and Belfin 2007; Shrestha, Moore, and Abdelnour-Nocera 2010). However, the issue of privacy in the mobile learning environment has not been discussed by many researchers except Ugray (2009).

6.2.1 Collaboration and Context - Summary of Discussion and Findings

The findings from the section on collaboration and context are summarized as follows:

- Collaboration and context have been associated with each other by the majority of stakeholders from the university leadership group in Pakistani universities. Mobile learning literature confirms this association as collaborative learning activities often take place when teachers and students are not in the same location such as students' data collection and fieldwork trips across different contexts.

- Informal collaborative activities using mobile devices are already taking place in Pakistani university environments; however, formal inclusion of these types of activities has not been attempted yet. Similar concepts of informal collaboration have been tested by other mobile learning researchers elsewhere (Kurti, Spikol, and Milrad 2008; MacCallum 2008).

- In Pakistani universities, students have been using mobile devices informally for data collection and fieldwork.

- Instructional designers warned that students might exploit the system by sending too many messages and burdening teachers with additional work because they need to respond to collaboration requests.

- Instructional designers also expressed their concerns that students might try to conclude their study results while on data collection visits, exploiting the collaboration opportunity with teachers; this may lead to a lack of detailed data analysis by students.

- Dentistry students have been engaged in collaboration using video conferencing and multimedia messages from mobile devices with their teachers in the university while visiting village dentistry clinics.

- Engineering firms and other businesses might not allow students to capture certain images or videos using their mobile devices even for data collection purposes, for privacy reasons.

6.3 Usability, Technical Support and Training needs - Results and Discussion

University administrative stakeholders including IT managers, campus directors and instructional designers were asked about any mobile device usability issues for learning, technical support available to mobile device users, and any training needs associated with their implementation of mobile learning. IT managers and instructional designers stated that there might be mobile devices usability issues for learning purposes such as small screen, tiny keypad, short memory and small battery capabilities. However, they argued that a number of usability issues associated with mobile devices such as inappropriate screen resolutions are due to the non-optimization of learning content for the mobile devices. Once the learning resources have been optimized so that they can be accessed and displayed on mobile device interfaces, the number of usability issues would reduce substantially.

> *'Students access our Information Servers or Learning Management Systems through their mobile devices. However, unfortunately, our applications are*

not optimized for mobile devices which make it very difficult to use them appropriately. There are major problems of screen resolution or content being too heavy to be downloaded/viewed on a mobile device.' [Uni A - IT Manager]

In the literature of mobile learning, a number of researchers have found that mobile device usability issues decreased when the application or prototype was designed specifically for mobile learning purposes. For instance, Hashim et al. (2011) found that a mobile learning tool designed and developed by following usability guidelines proved to be a useful revision tool for higher education students. Similar experiments have been conducted by Fetaji et al. (2011) and Sahilu et al. (2010) showing a reduced number of reported usability issues by users of the mobile learning applications and prototypes used in these studies.

However, when discussing the usability issues related to mobile internet or overall network connectivity, IT managers from Pakistani universities stated that there were minor usability issues related to network connectivity on mobile devices. They stated that mobile device users across the university did not need much technical support on a regular basis after their devices had been configured with the network. However, ongoing IT and technical support would be readily available if mobile learning users were to need it in future.

'We have a support department which is responsible for providing support to all network users. Generally, mobile device users contact us when they need to register their device with the network initially. After that, things work quite smoothly. There are some issues with the network sometimes; those are resolved at the back-end normally. Students do not face any problems in this sense. Network configuration is done systematically which makes the process easier for mobile device users as well. We allocate the same user name and password which they use in the lab or from campus workstations to connect to the network.' [Uni A - IT Manager]

'Initially, mobile users have to register with our department with their student ID and department information. Usually, students and teacher face few difficulties, particularly when they change their mobile device; they have

few issues of configuration with university network. We provide support for this kind of issue; however, we do not provide support for the configuration of their personal mobile devices with other networks such as from private telecom providers. For study-related issues, we take 100% responsibility to provide technical and IT support for their mobile devices. Overall, mobile users across the university do not have many technical support issues.' [Uni C - IT Manager]

Literature studies also show that experienced mobile users might not face many usability issues or such as discussed by Kukulska-Hulme (2005b) and Koole (2009). In addition, during the students' focus groups discussion sessions reported in Chapter 4 in this study, it was found that many mobile device users opted to resolve minor technical or connectivity related issues by seeking help from family and friends or by calling the customer service department of their telecom provider company. Similarly, regarding the training needs of mobile learning users, many of the stakeholders were of the view that users might not need much training in terms of using mobile devices for learning purposes as many users who possessed such a device had some user expereience with that device; therefore, a one-off training session at the start of any mobile learning implementation project would serve the purpose.

'Absolutely, we do provide training to staff and students for general IT matters; therefore, it would be fine to train them for mobile learning. But I can tell you, people are so keen and already experienced mobile users, they may not need to be trained much for the purpose of mobile learning. Everybody is tech-savvy here; only very few people are less involved in IT and use of mobile technologies these days.' [Uni C - IT Manager]

'I think they are quite experienced in using those devices, so there will be no concerns about training them to use devices. They already know enough of that. To me, the main and most important point is to have an app which is easy to use and assists students to participate in mobile learning activities.' [Uni A - Instructional Designer]

On the other hand, many of the interviewees including IT managers and instructional designers stressed the need for the strong technical support during the process of redesigning and developing the learning content to make it suitable for mobile devices. This technical support includes the development of learning apps and modification of existing learning management systems in order to effectively respond to requests from mobile learning users and successfully handle the day-to-day IT support issues raised by mobile learning users.

> *'Currently our courses are not well-designed for mobile learning; we need to prepare proper content that may be used for this purpose.' [Uni B - Instructional Designer]*

> *'There is a lot of work to be done in terms of application development. As far as the network is concerned, they may not face many problems.' [Uni A - IT Manager]*

> *'The other problem is related to the design and development of mobile learning apps. You have to design those apps, thinking about the content covered in those activities, assessment activities such as assignment and quizzes etc. You have to have a separate interface for students and for teachers.' [Uni A - Instructional Designer]*

On the question of teachers' need for appropriate training to redesign and redevelop learning content for mobile devices, most of the administrative stakeholders agreed that teachers would not only need extensive and ongoing training, but also a strong technical or IT support team to assist them.

> *'Currently, I will not be able to prepare some of the course contents to be placed online. It will only be possible after the availability of proper resources and training.' [Uni B - Instructional Designer]*

> *'Yes, I can design learning material myself but I would need the help of device experts in this process.' [Uni C - Instructional Designer]*

> *'The full potential of mobile learning can only be perceived once practically used; however, it will require training and content preparation. The limited use of a mobile phone has already been employed by many teachers on an individual basis. There is a need to employ such strategies on the institutional level and proper policies must be defined.' [Uni B - Instructional Designer]*

Mobile learning literature does consider this issue of mobile learning content redesign and development in the form of learning activities and the means of converting them into learning applications, podcasts, vodcasts and other forms to be accessible on mobile devices. Researchers in the literature have developed and tested the prototype of a certain type of mobile learning application as reported by (Hashim, Wan Ahmad, and Ahmad 2011) and (Sahilu, Ahmad, and Haron 2010) for the purpose of research. The Dean of the Engineering Faculty from University B argued that the university would need a dedicated technical support department just to support the mobile learning initiative if it were launched in the future. Therefore, in order to design and develop mobile learning content for university-wide implementation, universities might need to hire expert mobile learning educational designers, programmers, mobile learning application developers. Alternatively, universities might need to negotiate with third party mobile learning educational designers and application developers. Unfortunately, mobile learning literature does not place much emphasis on teachers' training needs prior to implementing mobile learning; nor have many studies discussed the necessity of roles for educational designers and mobile learning application developers in order to assist teachers to start with the mobile learning implementation smoothly.

In addition, another important aspect was highlighted by two interviewees who believed that teachers from IT, Computer Science and Engineering backgrounds might already be well versed in IT and they may not need much technical support to redesign and redevelop learning content for mobile devices. However, teachers who have not embraced the latest IT trends or teachers from non-IT related disciplines such as Humanities or Islamic Studies might not be able to undertake mobile learning content design and development by themselves at all; they would require rather a lot of training in order to become active and confident users of mobile learning devices.

Overall, stakeholders on key leadership roles within the universities were positive about providing teachers with the required training and ongoing technical support to upgrade learning content for mobile devices.

> *'To launch mobile learning in our university, there would be a need for a proper team or support department working on it at the back end such as they are doing in a virtual university. As you know, course contents need to be created and revised at regular intervals which make it a continuous process. Teachers' concerns are very valid in terms of support and training. There must be a team or support department dedicated to helping teachers if they want to record their lectures or update course contents.' [Uni B - Administrator]*

> *'For my course, the level of difficulty would be medium because already it has been done. However, other colleagues who will be doing it for the first time might face more difficulties and would need more help and training to do that.' [Uni A - Instructional Designer]*

> *'As for the training aspect, I think teachers in tech disciplines such as IT, computer science and engineering may not need much training as they already know all about it. A once-only orientation training session would suffice for them. However, teachers from non-IT related disciplines or some senior professors who are usually not comfortable with the latest technologies might need comprehensive training at regular intervals.' [Uni B - Administrator]*

> *'I think yes, because our university is quite progressive and has a positive attitude to embracing innovations and new technologies in teaching and learning. Therefore, I don't see that there would be any limitation in welcoming and supporting a mobile learning initiative that includes providing support to teachers to create and redesign learning material.' [Uni C - Administrator]*

One of the IT managers representing University C, however, discussed current efforts in reference to the optimization of learning resources for multiple platforms.

For example, he stated that the university's learning management system has been developed in such a way that it can be accessed through multiple interfaces such as PC, tablets and mobile devices. Therefore, this could be an advantage for mobile device users and they might not face major issues if mobile learning were introduced in the university.

> *'Another important point to mention here is that our learning content is already somewhat compatible to be accessed and opened on mobile and tablet devices successfully. All the learning content is in a web-based learning management system that people can access through mobile devices, laptops or desktop PCs.' [Uni C - IT Manager]*

IT managers and instructional designers from the other two universities also mentioned that there were ongoing efforts in their universities to create and update learning content to make it accessible via mobile devices. For instance, one IT manager mentioned that staff had been hired to assist teachers to record their lectures in audio and video formats. These audios and videos were available for students to download from the university's learning management system. However, at that time it was not compulsory for every teacher to record lectures. Mobile learning literature supports these findings as many studies including Lundin et al. (2010) and Idrus et al. (2010) have recommended using education providers' existing ICT infrastructures as well as students' and teachers' own devices as an input and precursor to mobile learning implementation in educational institutions.

6.3.1 Usability, Technical Support and Training Needs - Summary of Discussion and Findings

The summary of the discussion and findings from the analysis of usability, technical support and training needs is as follows:

- IT managers mentioned that a number of mobile device usability issues were reported due to the unavailability of optimized learning resources for mobile devices. However, the teachers and students did not report many usability-related problems related to network and mobile internet configuration.

- Interviewees stressed the need for strong technical and IT support for the teaching staff during the process of redesigning and developing learning content suitable for mobile devices.

- Overall, university administrative stakeholders were positive about providing teachers with required training and ongoing technical support to upgrade learning content for mobile devices.

- Teachers from non-IT related disciplines and backgrounds might need more extensive training in order to be involved in mobile learning.

- Administrative stakeholders from all of the participating universities reported that there were existing efforts to upgrade ICT infrastructure and web-based learning management systems, and these efforts would make it easier to introduce mobile learning in university environments in Pakistan.

6.4 Flexibility - Results and Discussion

Mobile learning adds flexibility to learning; this is one of the greatest arguments in favour of implementing mobile learning in universities in different parts of the world (Kukulska-Hulme 2009; Schneider, Bleimann, and Stengel 2009). The participants in this research study agreed that mobile learning would add flexibility to the university teaching and learning environments in Pakistan.

> *'My personal opinion is that mobile devices are a good addition in teaching and learning environment provided that they are adequately, ethically and appropriately used. Readily available learning resources on mobile devices would facilitate learning communities in third world countries in general.' [Uni C - Administrator]*

> *We will definitely encourage mobile learning to be tested in our university. We do not have any problems with adopting this technology in learning. You can see mobility in every walk of life these days, so why not education? [Uni C - IT Manager]*

Instructional designers mentioned that teaching staff can optimize their consultation time with students by allowing them to send their queries online and they would respond through mobile devices when convenient and in their own time. For students undertaking medical studies, one of the participants suggested that students might not need to merely rely on their memories for all of the medical equipment or medicine names; they would be able to consult eBooks and dictionaries accessible on their mobile devices when needed for a particular diagnosis.

> *'Obviously, it is very beneficial. You have the flexibility to share and access learning resources anywhere and anytime. Traditionally, a teacher is available to students between 8:30am to 4:30pm; a student may consult on things, have discussions or attend lectures during those hours. With the introduction of mobile learning, those students who have missed lectures for some reason can listen to recorded lectures and access learning resources remotely or in their homes. They may be poor attendees but they can be exposed to the knowledge. I think mobile learning offers many benefits. It liberates learners from being location-dependent or time-dependent. They can submit their assignments from home or any other place they are in. They can access information timely and use it when it is needed. They can subscribe to alerts; the information will be shared instantly. With mobile learning, you are connected to learning resources all the time.' [Uni A - Instructional Designer]*

> *'That would be beneficial for students in terms of diagnosis and prescribing medications for the patients. Students may not need to memorize medication names and dosage requirements. It would be useful to access the information using their mobile devices in order to prescribe correct dosage for a particular patient instead of just relying on the memory.' [Uni C - Administrator]*

> *'Yes, it will provide a greater flexibility; they can use it to enhance their scope beyond the limited text provided by books but again teachers have to continuously interact to filter the contents for students. Time would be saved due to ease of access to the learning resources. Procrastination of students*

and teachers to do some learning tasks can be decreased by availability of mobile learning option.' [Uni C - Instructional Designer]

For medical students and trainees, similar experiences have been recorded by Luanrattana et al. (2010) and Garrett and Jackson (2006) who have shown the benefits of the flexibility of accessing learning resources and collaborating with peers and supervisors using mobile devices.

Despite all the positive comments expressed by the majority of participants, several concerns were also raised regarding the flexibility added by mobile devices to the university learning environments in Pakistan. For instance, in one of the participating universities, a student needs to show an attendance of 80% or more in order to pass the unit and be allowed to sit for final examinations; administrative stakeholders were concerned that students might not physically turn up for classes if they were offered learning resources via mobile devices. In the literature, Copley (2007) found that the availability of podcasts for students engaged in mobile learning negatively affected their physical attendance at lectures. In Pakistan, this situation may cause mobile learning to conflict with university policies. Hence, universities might need to modify certain policies if they are to embrace mobile learning. Mohamad (2012) mentioned that certain policies needed to be changed in Malaysian schools in order to implement mobile learning and integrate it into the existing learning environments. One of these policies was to allow the use of mobile phones on school premises – something which had been previously banned.

Furthermore, it would be very important to ensure that students were engaged in learning activities even if they accessed learning resources remotely through mobile devices, as it would be unlikely in a typical Pakistani university education system that learning would occur if students were not monitored in some way in mobile learning mode. As mentioned by one of the instructional designers, all of the stakeholders and beneficiaries of mobile learning would need to know that mobile learning would be an additional, but not an alternative, mode of learning in Pakistani university environments.

'Definitely, it can be deployed and it may also be successful but there is a lot of work involved. A number of issues might need to be considered. For

example, in mobile learning mode, how you will ensure the attendance of students in a class which is required in our typical learning system? To my understanding, mobile learning may lift time constraint. People can be involved in the learning process at their own convenience. So, in this case, the mobile learning model has to ensure that people do actually engage in learning. Who knows? People might not bother to come online during class time and for other learning activities etc. The mobile learning model must be very strong in this case. These are a few of my concerns; otherwise, mobile learning is very good and it should be included in the university learning environment.' [Uni A - IT Manager]

'That is true because it will make many tasks easier than the currently used practices. However, from my previous experience, students are often too busy with other activities to get any benefit from online resources.' [Uni B - Instructional Designer]

'Mobile devices should have a healthy share of a university's learning environment because they provide an additional but not alternate source of learning.' [Uni C - Instructional Designer]

There is a considerable ongoing debate in mobile learning literature regarding the assessment of the learning process using mobile devices and the evaluation of mobile learning activities (Georgieva, Smrikarov, and Georgiev 2011; Petrova 2010; Ruchter, Klar, and Geiger 2010; Ting 2013). It appears that the concerns raised by participants in this research study are similar to those expressed in the literature.

6.4.1 Flexibility - Summary of Discussion and Findings

The following points summarize the discussion and analysis of the above section on Flexibility:

- The participants agreed that mobile devices would add flexibility to the teaching and learning environment in Pakistani universities.

- Teachers might be able to optimize their student-consultation time by allowing their students to send queries online using their mobile devices.

- An administrator from a medical school mentioned that medical students might be able to consult eBooks and medical dictionaries using their mobile devices instead of relying solely on their memories.

- Availability of learning resources on mobile devices might negatively impact on students' motivation to actually attend lectures and laboratories, ultimately putting them in danger of dropping out of university because they have not maintained a certain percentage of attendance in accordance with university policy.

- Universities might need to modify some of key policies in order to introduce mobile learning in Pakistani university environments.

6.5 Blending - Results and Discussion

In Pakistani university environments, administrative stakeholders were of the view that mobile learning may be partially offered along with existing learning forms such as traditional face-to-face learning. They did agree that there were potential benefits to be had from introducing mobile learning into the university environments. However, they suggested that it would be wise to conduct a pilot study and test implementation prior to considering the inclusion of mobile learning in formal or mainstream university learning environments.

> *'Mobile devices can be a great help if incorporated in learning; they surely would enhance the capacity of both teachers and students to access the resources and communicate with each other more frequently. Yet, thinking on relying ultimately on mobile devices would ruin the most conventionally tested and successful learning methods, which require direct interaction of both teacher and student in a controlled environment. Furthermore, the successful application of learning through mobile devices may vary for different courses and programs.' [Uni A - Administrator]*

> *'It's too early to talk about the success of such devices in a Pakistani university environment. But the introduction of such devices may foster the learning patterns in specific courses and programs. Personally, I would recommend that mobile devices must be tested in a Pakistani environment on a small scale to examine the benefits and disadvantages of such smart applications in learning.' [Uni B - Administrator]*

Mobile learning literature documents numerous case studies in other parts of the world where pilot studies were conducted in educational institutions including universities and other higher education institutions to test mobile learning initiatives; many of these case studies have been discussed by (Kukulska-Hulme and Traxler 2005) and (Vavoula, Pachler, and Kukulska-Hulme 2009).

The analysis of stakeholders' interview responses found that a number of informal mobile learning practices were already in vogue among the teachers and students in Pakistani university environments to facilitate communication and collaboration for learning purposes; these informal mobile learning practices indicated that a blended learning environment in Pakistani universities is evolving. In addition, universities have been allocating an increased budget and more resources in order to add technology to the traditional learning environment, including training staff for teaching via technology.

> *'I think mobile learning is very good if it is introduced in our university. There are a few things happening already such as recording of video lectures. I think this should be introduced as it has many benefits as well as proper utilization of resources; the potential of a mobile device goes beyond just voice call and SMS. It is very good to provide learning through mobile devices.' [Uni A - Instructional Designer]*

Participants also raised the issue that not all types of learning content are suitable for teaching in mobile learning mode. Mobile learning may work better for certain courses, units or subject areas than others. For example, the teaching complex algorithms of engineering and programming courses might not be accomplished

smoothly in mobile learning mode as students and teachers may need to discuss the complexity of algorithms in a traditional face-to-face learning environment.

Further, it may be easier for teachers to switch to mobile learning for certain courses. For instance, theoretical material may be converted into small chunks of information that can be shared with students using mobile devices. However, for practical, hands-on courses, it may be necessary to create animations which would require teachers to have a higher level of technical skills, or they may need to be developed by expert third-party content or software developers. Therefore, blending mobile learning with existing forms of learning would be the best way to start in Pakistani university environments.

> *'Particularly in medical fields such as in our university, I think mobile devices may be coupled with traditional teaching and learning where learners may have hands-on experiences in labs and classrooms. For example, as far as information related to a particular course and reading material is concerned, we can make it available on the mobile devices of students. However, in order to apply that information in practice, they need to be physically in a laboratory situation. There are limitations to the type of learning that can be done through mobile devices. On the other hand, I would definitely encourage mobile learning to be used for the theoretical part of the courses as well as 3D models being made available on mobile devices; this would greatly help students to understand the basic concepts of the dentistry discipline.' [Uni C - Administrator]*

Mobile learning literature supports the idea of a blended learning environment where mobile learning may be partially introduced to augment existing learning forms. A number of mobile learning researchers including Peter (2007), Shen et al. (2008), Wang et al.(2009), Parsons (2011), Pachler et al.(2012) and Albrecht et al.(2013) have successfully presented the argument for mobile learning as part of a blended learning environment.

6.5.1 Blending - Summary of Discussion and Findings

The following points are a summary of discussion and findings of the participants' opinions on the blending of mobile learning with existing forms of learning:

- Administrative stakeholders in Pakistani universities wanted pilot studies and test implementations of mobile learning prior to seriously considering the introduction of mobile learning into mainstream teaching and learning.

- Teachers and students were already engaging in many informal mobile learning practices, indicating that there is already an informal blended learning environment in Pakistani universities.

Mobile learning may work better for certain courses and learning materials within each course such as small learning activities for theoretical courses and creating animations for practical type courses. Therefore, blending mobile learning with existing forms of learning would work best.

6.6 Usage and Connectivity - Results and Discussion

IT managers from three universities were interviewed about mobile internet usage as well as connectivity issues encountered by the users across universities. All of the IT managers reported state-of-the-art network facilities for users including the availability of campus-wide free Wi-Fi with speed ranging from 1MB to 50MB and downloadable data up to 35GB for each user per month. Users have 24-hour access to university networks on campus and in university-owned hostels. IT managers reported that the number of users connecting with the university network with mobile devices has significantly increased over the past few years from zero to around 1,000 users on average. The popularity and use of the internet and social networking sites have boosted mobile internet usage as people want to have an online presence all the time.

> *'Yes, we have had a dramatic change in our network status and user base for the last couple of years. The main reason is the increase in mobile device users connecting to the network and using mobile internet. Wi-Fi-enabled*

mobile devices were quite expensive but now their prices are getting lower and students are tending more towards using them. There is the other important fact that people cannot live without internet these days. They like to be connected to social networks all the time. They are engaged in a virtual social life more than in a physical social life.' [Uni A - IT Manager]

Lu and Korukonda (2008) discovered that students who used Wi-Fi internet on mobile devices tend to be more involved in student-centred learning activities using their mobile devices. Similarly, other researchers such as Barker et al. (2005) and Oliver et al. (2008) found an increase in the use of mobile internet and learning activities among university students in African countries.

On the question of technical and IT support for mobile device users, IT managers stated that initially all users of mobile devices have to seek support from the IT support department for setting and configuration purposes; however, thereafter they do not need much support on a daily basis. IT managers showed a positive attitude to the introduction of the mobile learning initiative in Pakistani universities in future and believed that the existing ICT infrastructure would be robust enough to support such an initiative in university environments. Some of the comments from IT managers have been qouted below:

'I don't think that there would be any major difficulty if we choose to use mobile learning in a formal learning environment because many users have experience of using mobile devices here. And I can see the trend of using mobile technologies is increasing day by day in Pakistan. I think it is a great advantage that learning resources are easier to access and at your disposal at all times. We must benefit from this great opportunity for learning and research.' [Uni C - IT Manager]

'Yes it does have an effect, despite its minimal usage so far, but due to different clouds access, different apps, data consistency on all devices, its increasing day by day, especially after usage of smart phones in Pakistan as well.' [Uni B - IT Manager]

> *'It depends upon the attitude of higher management, but in the last two years, our university has been providing specialized android programming courses. University also provided a few smart mobile devices for students enrolled in those courses to test their programming applications. As far integration is concerned, yes it could be done, as the basic infrastructure is there in terms of internet bandwidth and Wi-Fi etc.' [Uni B - IT Manager]*

> *'We will definitely encourage mobile learning to be tested in our university. We do not have any problems with adopting this technology in learning. You can see mobility in every walk of life these days, why not education? For the connectivity, we would always strive for better quality. As I told you earlier, users are already experienced; there would not be any major issues if we implement mobile learning in our university after a couple of years or even today.' [Uni C - IT Manager]*

One of the IT managers, however, pointed out that they had not tested their network for large numbers of mobile device users accessing the learning management system while connecting to the university network. Other than network connectivity issues, there might be difficulties in optimizing learning resources for mobile devices which also involves financial support from the university.

> *'There is a lot of work to be done in terms of application development. As far as the network is concerned, they may not face much problem. However, we did not test it for mobile learning though. We provide services for mobile devices but we do not take it very seriously because we know that they use it for social networking etc. Also, all students must have similar devices; the university may support them as they do for laptops etc.' [Uni A - IT Manager]*

During an interview with an instructional designer from University A, it was mentioned that connectivity for mobile learning is not just limited to having an efficient Wi-Fi network on campus. Students and teachers would need network connectivity or mobile internet outside the university-provided Wi-Fi range in order to continue their engagement with teaching and learning while on the move.

According to this instructional designer, universities may need to play a role in providing mobile internet access for mobile learners outside the university's Wi-Fi range.

> *'Secondly, connectivity is another concern. If you are on campus, you can access Wi-Fi and get better connectivity. If they were to access outside the university, they may face connectivity problems and cost would be another issue if they buy mobile internet data packages personally; that can be very expensive for them. If the university facilitates mobile internet for the users, it would be ideal.' [Uni A - Instructional Designer]*

Mobile learning literature also indicates the need for substantial resources in order to implement and integrate mobile learning into existing learning environments, not only in developing countries but also in developed countries (Adesope, Olubunmi, and McCracken 2007; Gururajan et al. 2011; Omar, Liu, and Koong 2008).

6.6.1 Usage and Connectivity - Summary of Discussion and Findings

The following is a summary of findings from the analysis of usage- and connectivity-related interview data:

- IT managers reported that it is likely that mobile learning initiative to be supported for universities that have a strong ICT infrastructure. However, the current ICT infrastructure has not been tested for mobile learning in most universities in Pakistan and it is recommended that a pilot study is needed to test the infrastructure prior to any formal implementation.

- IT managers reported that the number of users connecting with the university network with mobile devices has significantly increased over the last few years due to the popularity of the internet and social networking.

- Universities will require a great amount of resources if they are to optimize learning resources compatible with mobile devices.

- Students and teachers can access only free university-provided Wi-Fi on campus; they might need to be supported by universities in order to buy mobile internet service outside of the university premises in order to engage in mobile learning activities anywhere and at any time.

6.7 Cost - Results and Discussion

When the question of costs associated with the introduction of mobile learning in Pakistani universities arose, the majority of participants were very clear about two main issues realating to costs: 1) cost of similar (if not identical) smart phones made available to all mobile learners; 2) cost of high speed mobile internet out of the free university-provided Wi-Fi range. These were two main costs mentioned by almost all of the participants including instructional designers, IT managers and university administrators.

> *'I want to mention one thing in particular - all students should have similar devices if we want to implement mobile learning in the university environment, otherwise it may result in many problems.' [Uni A - Instructional Designer]*

> *'Costs include expensive devices which are useable for learning purposes, and to buy internet time.' [Uni C - Instructional Designer]*

Dyson et al. (2009) mentioned that these costs in particular were the main obstacles to the implementation of mobile learning in higher education environments. Participants in this study stated that if mobile learning is to be tested or introduced without resolving the cost issue associated with mobile devices, it might give rise to more problems as students from low income backgrounds would not be able to buy those devices from their own pocket, and the universities' promise of providing equal opportunity would be breached. The users from more affluent backgrounds might consider it a status symbol to have expensive mobile devices and increase the gap or digital divide between poor and rich in the university environment. Furthermore, as parents support their children's education in Pakistan, it would be an additional

burden for parents to buy their children an expensive mobile device for learning purposes.

> *'If it were the user's choice, it would be very challenging as few users can pay more and others can afford to pay less. Speed of mobile internet is related to how expensive a plan you can afford. However, if it were provided by the university, it would be a better option.' [Uni A - Instructional Designer]*

> *'Students in University A are mostly from low-income families; therefore a big percentage of them cannot afford high-end mobile phones and the associated connection charges. However, the students in private sector universities tend to own high end mobiles; therefore can get more benefit from mobile devices based learning.' [Uni B - Instructional Designer]*

> *'It depends on the university how much they want to spend on that. I think the university has to give a lot of support in terms of expenses for a mobile learning initiative. Further, if this system were implemented, then it should be the same for everyone. I mean, mobile devices and applications should be the same for all users; otherwise, the mobile learning initiative might not be successful in our university.' [Uni A - Instructional Designer]*

> *'People who have expensive mobile phones might use them as a status symbol that may discriminate against those who do not have those devices.' [Uni C - Instructional Designer]*

> *'Parents of students may be pressurized to buy expensive phones for their children for learning purposes; this can impose an extra burden on parents.' [Uni C - Instructional Designer]*

Mohamad (2012) and Sife et al. (2007) have also identified the issues of a digital divide in higher education institutions among the students who own a smart phone and those who do not. Although mobile learning in developing countries has huge potential and will bring greater benefits, implementation needs very careful planning

in order to avoid complications (Adesope, Olubunmi, and McCracken 2007; Gary 2007; Traxler and Kukulska-Hulme 2005).

On the other hand, in spite of agreeing that these two cost issues are potential obstacles to the future implementation of mobile learning, interestingly, many of the participants had a number of suggestions to resolve these cost-related problems in order to make the mobile learning initiative a reality in Pakistani university environments. For example, participants from University C suggested that the university could subsidise students or provide loans for the purchase of mobile devices for learning and students could pay back in instalments. The comments were:

> *'The university may not be able to give away mobile devices to students even for learning purposes. However, the university may be able to provide a subsidy for buying mobile devices for learning purpose. Some time ago, the university tried to support students to buy IT equipment for learning. Students could not pay their loan instalments and ultimately the university had to bear all the expenses; therefore, university administrators might hesitate to do the same for mobile devices.' [Uni C - IT Manager]*

> *'Currently, we are working on that. We have changed our conference room upstairs into a learning facility where this kind of proposal is being planned. However, at this stage we are not providing any mobile device to any user. They would have to buy their own mobile devices but the university will provide free access to Wi-Fi, internet and learning resources. I have reservations about providing around 75 students enrolled in a course with such equipment, even on loan. It would be difficult to expect that kind of responsibility to take care of and return the device in a good and reusable condition. I am afraid the university would not finance the purchase of devices for students. However, the university may be able to provide a subsidy or loan to students to buy their own mobile devices so that they can engage in mobile learning. In this case, there would be an element of ownership of the device for the students and they would be more responsible in taking care of their devices.' [Uni C - Administrator]*

A number of participants mentioned that if mobile devices were successfully introduced into teaching and learning practices, universities could save an enormous amount of money in terms of maintenance of computer labs, purchasing new computers and accessories, installation of wired network, requiring fewer support staff and the availability of eBooks instead of physical books. Universities could assist students to buy mobile devices and negotiate with private telecommunication companies to provide cheaper mobile internet for students.

> *'There are many positive aspects of mobile learning such as many books can be purchased in soft form by institutions to provide students free access; it will overcome affordability problems.' [Uni C - Instructional Designer]*

> *'The university may not be able to provide mobile devices for students. However, we could handle it in some other way such as asking students to bring their own devices if they want to enrol in a course offered in mobile learning mode. Mobile learning is available 24 hours, if students want to enjoy the flexibility in their learning; they have to look for facilitating themselves outside the 8-hours period they spend on campus. Mobile internet is as cheap as 1 rupee a day so that everyone can afford it. The university may also be able to support the students enrolling in mobile learning courses by reducing their semester fee as the university also saves on resources such as electricity, rooms, and computer labs when students switch to mobile learning. Furthermore, the university is already in the process of negotiating with private telecommunication companies to provide discounted rates for mobile voice and data packages on the provision of valid student ID card by the student, so this could also be beneficial in the case of mobile learning.' [Uni B - Administrator]*

In mobile learning literature, many researchers have been investigating novel yet cost-effective mobile learning solutions for the people of developing countries, particularly underprivileged populations; the aforementioned suggestions from participants in this study complement and add to those proposals (Barker, Krull, and Mallinson 2005; Masters 2005; Shrestha, Moore, and Abdelnour-Nocera 2010). In addition, universities could introduce BYOD policy for mobile learning; this will not

only utilize the devices already used and brought by students to university but also reduce the pressure and load on university-owned computer laboratories.

6.7.1 Cost - Summary of Discussion and Findings

The following is a summary of the discussion and findings emerging from the analysis of participants' opinions about the costs associated with mobile learning in Pakistani universities:

- Almost all of the interviewees mentioned two main costs: cost of smart phones or advanced mobile devices, and cost of mobile internet outside the university Wi-Fi range.

- If universities provide no assistance to students so that they can have similar or identical mobile learning devices, there is a great risk of increasing the digital divide within the wider communities. The users from more affluent backgrounds might consider it a status symbol to have expensive mobile devices and this would increase the gap between poor and rich in the university environment.

- Parents are responsible for supporting their children's education in Pakistan, so it would be an additional burden for parents to buy their children an expensive mobile device for learning purposes in the event that universities did not assist with the purchase of mobile devices for learning.

- A number of interviewees mentioned that if mobile devices were to be successfully included in teaching and learning practices, universities could save an enormous amount of money in terms of maintenance of computer labs, the purchase of new computers and accessories, installation of wired network, requiring fewer support staff and the availability of eBooks instead of physical books.

- What about the point that the univeristy would not be obligated to purchase mobile devices for students? This was mentioned by one of the administrators.

6.8 Control - Results and Discussion

During the discussion of the teacher's role in mobile learning, almost all of the participants strongly emphasized that the teacher's role should not be compromised or ignored in order to make students independent learners. University administrators and instructional designers were asked whether students would be more independent learners in a mobile learning environment; they agreed that students would be undertaking self-learning. Some of the senior executives believed that when students learn that they have to be disciplined and responsible, they are learning to be self-regulated and they learn to look after their own property and the university's property (this could be a mobile device). However, it was strongly recommended by the interviewees that the teacher should control and mediate the learning process in order to regulate learning among different cohorts of students and to enforce certain assessments and deadlines.

> *'I think it totally depends on how you make the rules and how you manage to enforce the rules in your university learning environment. It is the same for distance learning or face-to-face learning. When you make rules and implement them strictly, students have to switch to regulate themselves to be independent learners. It is the teachers' responsibility to engage the students in learning in such a way that every student should feel responsibility to submit their assignments on time, and there must be penalties for late submissions. Students tend to follow the teacher even in online or traditional learning mode. If teachers or course leaders know how to run a course and implement certain rules, it is possible to lead students in a certain direction.' [Uni B - Administrator]*

> *'Yes, this is something to be discussed in detail. I think the teacher's involvement is very important and necessary. If you look at the virtual universities' model or other online learning environments, there is the teacher's involvement although students are able to access all lectures and learning resources on their own. I don't think that they will be able to do self-study. Teachers should have control over the learning process even if it is offered through mobile learning or e-learning mode. It is very important*

> *because students do not have vision and guidance which a teacher can give them besides learning resources. Teacher knows the breadth and depth of course contents and what is an appropriate level for students to reach. Students are beginners, they do not realize where to go ultimately, and it is the teacher who paves the way for them.' [Uni A - Instructional Designer]*

In spite of stressing the pivotal role of the teacher, participants did agree that mobile learning might bring about a change to students' attitudes and could encourage students to learn independently of teachers. This is a positive outcome – the old school of thought that prevails in teaching and learning communities in Pakistani universities would think this is a problem/hindrance. A new school of thought, however, would accept the paradigm shift to allow and empower students to think and learn for themselves.

> *'Yes, a mobile device is a kind of digital teacher or facilitator and will help students in continuous interaction for their guided learning in the field.' [Uni C - Instructional Designer]*

> *'This may vary from course to course and from one program type to another; but generally, it must improve the self-capacity and learning of the students without intervention by the teacher.' [Uni A - Administrator]*

Chen (2009) argues that self-regulated learning has become a critical success factor for learners in today's blended learning environment where a learner has to interact frequently with Learning Management Systems without the teacher's monitoring. In a mobile learning environment, self-regulated learning can be used to enhance students' perfomance in university and a mobile device could play the role of *digital teacher* for students as mentioned by one of the participants of this research. However, the cultivation of self-regulated learning habits in students remains a crucial step and needs further research. Kukulska-Hulme (2012) mentions that teachers' own commitment to informal learning and appropriate training in new technologies could play a key role in bringing about change in students' attitudes toward learning.

However, some of the participants adhering to the somewhat old school of thought warned that mobile learning might become a mere waste of time and resources if the process of learning were not controlled by the teacher. Participants believed that students would tend to indulge in social networking only and other non-learning activities by using mobile devices and mobile internet made available to them for the purpose of learning.

> *'I think teachers should put some restrictions on how students may use it. For example, they should not indulge in social networking and communicating with each other all the time. This may result in time-wasting for both parties. If we allow limited features just focused on learning, then it would be more beneficial.' [Uni A - Instructional Designer]*

> *'Mobile is a useful tool for learning but wastage of time should be controlled. Mobile learning may encourage self-study which is very good. However, it should be monitored and guided by teachers.' [Uni C - Instructional Designer]*

Contrary to the participants' perceptions that students might waste time merely in social networking using their mobile devices, researchers such as Selwyn (2009) and Madge et al. (2009) found that students have been using social networking forums to support their learning in various ways including settling into university life, discussing assessment tasks, providing moral support to fellow students during diffiuclt times in university life, increasing engagement in learning activities and improving their relationship with teaching staff and fellow students. Slewyn (2009) acknowledges that some of the stakeholders in university envrionments are concered that students might engage in social activities; however, based on the findings of a study conducted in a UK university about the use of Facebook, he further argues that social networking forums would be assumed and used as new learning spaces in today's university environments. The concept of social learning might be inroduced into Pakistani university environments which will assist senior leadership groups to consider mobile learning as a window of opportunity to open up new learning spaces in university environments.

The teacher's role in a mobile learning environment has been debated by a number of researchers in mobile leaning literature. Kukulska-Hulme (2010) argues that instead of shifting from teacher-centred to student-centred learning, a balanced participation of teachers and learners might be ideal for a mobile learning environment. Similar findings were revealed by Uzunboylu and Ozdamli (2011) who researched teachers' perceptions about mobile learning in Cyprus; the teachers wanted to switch to learning technologies including mobile learning in order to engage themselves and their students in a constructivist learning fashion. (Kukulska-Hulme 2012) recommends that stakeholders in higher education should be open to adapt new technologies and pedagogies in university environments such as social media and informal learning. Therefore, appropriate staff development and training would be required in order to equip teaching staff with the hands-on knowledge about new technologies in learning so that they might be able to portray themeselves as role models for students in terms of social media and informal learning.

During interviews conducted for this study, one of the instructional designers suggested that mobile learning would work better if it is introduced to the students who have already spent a few semesters in the university's teaching and learning environment instead of freshmen or students studying in their first semester as the former would already have become more responsible and independent learners. Moreover, one of the administrators stated that students' development in a developing country may be different if compared to the developed world, particularly in terms of handling the learning resources and facilities as their experience in this area is limited. For example, he was of the view that undergraduate students in the university were not mature enough to handle such an exposure to mobile devices and internet in their private spaces; they would be at greater risk of engaging in non-constructive activities instead of mobile learning.

> *'I think it might not be so straightforward here as compared to the developed world. Particularly, I am concerned for the students who come from relatively backward backgrounds or areas. I don't recommend giving them mobile devices and letting them go away to their isolated private places such as hostels where no scrutiny can be done on the kind of material they are watching on their mobile devices. They may be introduced to mobile learning*

in a library situation or common room where they can access learning resources and engage in constructive learning activities and where their activities are supervised. Undergrads are of the age where they leave home and enter into a world with more freedom, so it is possible that they could engage in non-constructive activities.' [Uni C - Administrator]

Sife et al. (2007), Sari and Tedjasaputra (2008) and Mohamad (2012) reported similar findings in other developing countries such as Tanzania, Indonesia and Malaysia. Mobile learning needs to be researched in developing countries in order to determine the best way of introducing it formally into different learning environments including higher education, secondary and elementary schools (Gary 2007; Saif 2013; Traxler 2013).

The mobile learning initiative could impose an additional workload on teachers; when this issue was discussed with interviewees, the responses varied. Senior administrators did not see it as producing an additional workload; they believed that teachers could reduce their face-to-face consultation time by using mobile learning which gives them more flexibility when responding to students' queries on the move. The workload is a contentious issue especially when teachers' view of additional workload differ to that of senior administrators. In respect to this, instructional designers saw mobile learning as an extra workload for teachers which needed to be compensated.

'As for the question of additional workload for the teachers, I don't see any additional workload for the teachers in this case. For example, we are already working on it in our university; we have advised teachers to provide learning material for a particular lecture such as presentations, assignment information, and lecture slides or handouts couple of days on the university intranet prior to actual lecture scheduled. Students can access this material and familiarize themselves with it prior to a lecture.' [Uni C - Administrator]

'I want to emphasize one important point here that teachers would have to set a time for interactivity and collaboration just like routine consultation time for students which will enable students to ask questions and clarify any

confusion they have regarding what they have heard in a lecture or seen in a video or audio lectures.' [Uni B - Administrator]

'Yes, it would be an additional task; it can only work if enforced by university administration.' [Uni A - Instructional Designer]

Chen et al. (2010) revealed contradictory findings showing the teacher's workload would be reduced by introducing formal mobile learning tools and applications where students would be able to do a number of learning tasks by themselves. Teacher's role, performance and workload are the issues which have not been addressed adequately in mobile learning literature. Future research is needed to investigate the implications of mobile learning for teachers in different learning environments.

6.8.1 Control - Summary of Discussion and Findings

The following points summarize the analysis of participants' opinions about the teacher's role in a mobile learning environment in Pakistani universities:

- The majority of the interviewees strongly recommended that the teacher control and mediate the learning process in order to regulate learning among different cohorts of students as well as to enforce certain assessments and deadlines. Some of the participants warned that mobile learning might become merely a waste of time and resources if the process of learning is not controlled by the teacher in Pakistani university environments.

- The majority of the interviewees did agree that mobile learning might bring about change in students' attitudes and encourage students to learn independently of teachers.

- Mobile learning would work better if introduced to the students who are in 3rd or 4th year of university studies instead of first year or newly-enrolled students as the former already have become more responsible and independent learners.

- One of the interviewees warned that undergraduate students in the university were not mature enough to handle such an exposure to mobile devices and internet in their private spaces; they would be at greater risk of engaging in non-constructive activities instead of mobile learning.

- In the case of mobile learning, teachers' workload management was an issue of concern to the instructional designers. Teachers also mentioned the issue of extra workload and unpaid overtime during the focus groups discussion as discussed in section 5.12.2 in Chapter 5 earlier in the thesis. However, senior administrators suggested that teachers could easily balance their face-to-face consultation time with mobile learning flexibility by responding to students' queries remotely.

6.9 Mobile Learning Activities - Results and Discussion

Administrative stakeholders from Pakistani universities shared their experiences of several practices already in place formally and informally in university environments. Many of these practices are either directly related to mobile learning or e-learning, or are an indirect step towards embracing new technologies in university teaching and learning environments. Instructional designers described the mobile learning activities and applications which they have observed their colleagues doing for their teaching and learning. IT managers mentioned the activities that IT departments and higher management have been doing or planning to do in order to provide students and teachers with more flexible and technologically-advanced strategies for their teaching and learning. Similarly, interviews from administrative stakeholders on policy-making roles revealed a positive and welcoming attitude to potential mobile learning initiatives in universities in Pakistan.

Several interviewees shared their observations of teachers' and students' involvement in mobile learning activities and applications. These observations correspond to the categories of mobile learning learning activities and applications out of data analysis for students' focus groups (see Section 4.10 and subsections in Chapter 4 for details) and teachers' focus groups (see Section 5.11 and subsections in

Chapter 5 for details). During the discussion in this section, references have been made to the relevant categories of mobile learning activities and applications from students' and teachers' focus groups.

During interviews conducted for this study, one of the IT managers stated that in spite of having no mobile-compatible version of the university's learning management system, a number of administrative activities (refer to category of Administrative Activities in Section 4.10 and Section 5.11) already in place in the university included students accessing the learning management system using their mobile devices to check their enrolment, attendance and grades.

> *'For example; CU-Online is our student information system and is available on the internet. So if a student wants to check his grades or registered courses or fee status then s/he may use the mobile device to connect to this system and get the required information.' [Uni A - IT Manager]*

> *'No, not yet. There is any mobile interface available separately for mobile users, although I have suggested to the university management that we should also have a mobile version of our website too. There is currently no mobile version of our software applications in this university but there should be.' [Uni A - IT Manager]*

Although these activities are not directly associated with mobile learning, this might be the first step towards the introduction of mobile learning to familiarise the students with accessing learning portals on mobile devices. It is also important to note that students might not be facing any usability issues in performing these administrative tasks as these are not typical learning activities which require reading or any sort of assessment. An instructional designer from University B mentioned similar activities he has been doing informally to facilitate his teaching-related tasks (refer to Administative Activities, Teaching and Learning Support Activities from Sections 4.10 and 5.11).

> *'I have a very limited experience of using mobile phones for teaching in our university. I use a mobile phone to communicate with students about a quiz,*

lecture rescheduling, contents to prepare before the next lecture.' [Uni B - Instructional Designer]

An instructional designer from University A said that she had been involved in mobile learning in a number of ways by, for example, recording audio and video lectures, using discussion boards, and updating students' grades and attendance records etc (Informal Teaching and Learning Activities, Collaborative Activities, Teaching and Learning Support Activities from Sections 4.10 and 5.11).

'Firstly, you can share lecture contents with students on all the topics to be covered during a course. You can record and upload lectures for students. You can include a discussion board where students can ask a question, the teacher can answer it and other students are able to view the discussion. Students can submit assignments. Teacher can share results and students can view these instantly. Also, students should be able to view their attendance status.' [Uni A - Instructional Designer]

IT managers also stated that learning content across the universities was being updated to make it accessible from different interfaces such as computers and mobile devices. Recording of video lectures is one of the many steps being taken to add flexibility to the learning environment.

'Definitely, it would be very positive and a valuable addition to our education system. Let me tell you something that we are currently doing in our university. We have started recording lectures and placing them on a Server, students are able to access these at their own convenience. They can refer to the lecture later on. It is not very interactive though, but still it gives them a lot of flexibility and control and independence about the learning process.' [Uni A - IT Manager]

'Another important point to mention here is that our learning content is already somewhat compatible to be accessed and opened on mobile and tablet devices successfully. All the learning content is in a web-based learning management system; people may access it through mobile devices, laptops or desktop PCs.' [Uni C - IT Manager]

Lecture recording and video conferencing were the other two activities being practised in all the participating universities (Collaborative Activities, Teaching and Learning Support Activities). In Pakistani universities, many of the teaching staff have chosen to undertake PhDs and other higher studies abroad; therefore, their universities ask them to teach through video conferencing remotely, instead of replacing them.

> *'In this university, we are aiming to have a facility for teaching and learning remotely. For instance, if one of our lecturers goes to England for higher studies, he may be able to deliver his lecture on a certain topic of his expertise from there to the students in our university. Further, some lecturers opt for recording their lectures and provide them to students through the university's learning portal. Students download those lectures into their mobile devices and enjoy flexible learning.' [Uni C - IT Manager]*

> *'Let me tell you something interesting. One of our bachelor courses which is being offered in 7th or 8th semester of our engineering degree is being taught totally virtually using video conferencing facility. The resource person is an assistant professor in Ohio State University, USA and he is delivering lectures from there as well as collaborating with students. However, students have to gather in one room where they can watch the video lecture live and ask questions. Mobile learning is one step ahead in this area. The same students may be able to watch a video lecture live independent of location and time as well as interact with their lecturer. Mobile leaning can hold and open multiple avenues of learning such as video, audio, text and even offline contents for learning.' [Uni B - Administrator]*

The Dean of the Engineering Faculty in University B said that students -during free time between lectures- have been watching video lectures on their mobile devices from many highly-ranked universities from developed countries freely available on YouTube in order to enhance their knowledge and understanding.

> *'For example, I have observed some students (who have enabled/purchased larger internet data packages on their mobile devices) watching MIT open*

courseware material or other learning videos on YouTube during their spare time in university.' [Uni B - Administrator]

Generally, IT managers and senior management personnel were positive about the future of mobile learning in Pakistani university environments. An administrator in a senior position in University A, however, was very cautious when commenting on the potential introduction of mobile learning in the university.

'I think yes, because our university is quite progressive and has a positive attitude to embrace innovations and new technologies in teaching and learning. Therefore, I don't see that there would be any limitation in welcoming and supporting a mobile learning initiative that includes providing support to teachers to create and redesign learning material.' [Uni C - Administrator]

'I believe the inclusion of such devices requires thorough orientation on the part of the university (lecturer) and the student… responding to this question directly without any understanding of the application of mobile devices and their success in a local environment would be inappropriate, if not inappropriate, may be very early. For me, I am eager to adopt technology and will certainly give it a try (for trialling and testing first) to assess the benefits and disadvantages of mobile devices application in a local system.' [Uni A - Administrator]

Another interesting aspect that emerged from interviews with the administrative stakeholders in Pakistani universities is that mobile learning was indirectly introduced to students by embedding the use of mobile devices in students' projects and fieldwork. In mobile learning literature, there are numerous examples where researchers have experimented by including mobile learning activities as an integral part of the course, projects, assignments and fieldwork (Caverly, Ward, and Caverly 2009; Cavus 2011; Hwang and Chang 2011; Pérez-Sanagustín et al. 2012; Ting 2013).

In University C, medical students were expected to use mobile device from remote locations to collaborate with colleagues and teaching staff in the university to discuss

the diagnosis of a particular patient as well as using mobile device camera to take photos of patients' teeth and send this using multimedia messaging. Computer science and telecommunication engineering students had been using mobile devices in their projects to test a particular output of a program or mobile application. In University B, students were being taught Android programming courses and each group of students was given several mobile devices to test their mobile applications.

> *'It depends upon the attitude of higher management, but for the last two years the university has been providing specialized android programing courses, along with smart devices, 1 to 2 mobile devices per section of students.' [Uni B - IT Manager]*

> *'Definitely, students would make use of mobile learning when they are away from their teachers. In this area, we are already setting up satellite clinics in our rural areas where a general dentist would go over there and if he has any problem with the management of a particular patient, he can take a picture with his mobile device and send it to a secondary care hospital in the city. Or he can use a video conferencing facility to discuss the issue with other colleagues remotely and consult.' [Uni C - Administrator]*

> *'Moreover, there is a Computer Science student group doing a project on a security and attendance system using iPhones within the campus.' [Uni A - IT Manager]*

> *'I have experienced it in number of ways. For example, I have used it in terms of application development. We developed a mobile ticketing system where passengers are able to book and buy tickets through their mobile devices. Obviously, it was learning in terms of development and user interface design. Last year, I supervised another project using mobile learning; the website was accessible to students through mobile devices.' [Uni A - Instructional Designer]*

Mobile learning literature shows that similar informal mobile learning activities (Informal Learning Activities, Informal Teaching and Learning Activities from Sections 4.10 and 5.11) were practised by teachers and students in many learning

environments prior to any formal introduction of mobile learning in both developed and developing countries (Clough et al. 2009; Lai, Khaddage, and Knezek 2013; Looi et al. 2010; Martí and Ferrer 2012). Literature supports that engagement in informal mobile learning activities, such as activities being done in Pakistani university environments, strengthens the argument for introducing mobile learning into mainstream education (Fotouhi-Ghazvini et al. 2008; Looi et al. 2010). Further, these informal learning practices might assist education providers to embark upon the research and investigation of using students' own devices for mobile learning which could assist to establish BYOD policies within the universities, thereby saving the education providers an enormous amount of resources (Lai, Khaddage, and Knezek 2013; Lundin et al. 2010).

6.9.1 Mobile Learning Activities - Summary of Discussion and Findings

Informal mobile learning activities and their implications for university administrative stakeholders are summarized as follows:

- In spite of having no mobile-compatible version of the university's Learning Management System, a number of administrative activities were already in place in the universities so that students accessed the Learning Management System using their mobile devices to check their enrolment, attendance and grades. Students' involvement in these administrative tasks might be a first step towards introducing mobile learning in Pakistani university environments.

- Students' and teachers' engagement in mobile learning activities and applications observed by administrative stakholders correspond to the categories of mobile learning activities emerged as outcomes of data analysis of students' and teachers' focus groups. This confirmation validates the rigor of the data analysis and results of the research.

- Other than administrative activities, some of teachers have been informally engaged in mobile learning activities to facilitate their teaching and learning such

as recording lectures and providing these to students, scheduling workshops, using discussion boards, and updating student's grades.

- It was found that mobile learning practices were very popular among Pakistani university students. For example, they used mobile cameras during their field work, and for testing outputs in programming projects and exhibitions.

- These informal mobile learning practices might assist Pakistani universities to investigate students' use of their own devices (if they have them) for mobile learning, thereby working towards the introduction of BYOD policies university-wide and ultimately saving significant amounts of university resources.

6.10 Socio-Cultural Factors - Results and Discussion

Similar to the socio-cultural issues discussed in Chapter 4 and Chapter 5, the university leadership stakeholders also expressed similar concerns and perceptions about considering and evaluating certain sociol-cultural factors when planning a mobile learning implementation initiative in Pakistani university environments. As alluded to earlier in this chapter and Chapters 4 and 5, one can also find a number of other socio-economic issues in the developing nation of Pakistan related to usability, training needs and the need for ongoing technical support. However, the following subsections discuss several additional issues that emerged from the research data; these are listed separately and represent the findings of this research.

6.10.1 Awareness and Motivation

Besides the positive responses in terms of embracing mobile learning in Pakistani universities, the interviewees were focused on the issue of creating awareness about the use of mobile technologies in teaching and learning environments prior to any attempt to test the mobile learning initiative in Pakistani university environments. A number of stakeholders and potential beneficiaries of mobile learning including teachers, students, university administrators and managers, instructional designers, course leaders, librarians and parents of enrolled students, could be considered as targets for an awareness campaign.

> *'It would be very good to introduce mobile learning in our university. However, the only thing lacking is the exposure of new technologies and their integration on smart devices and mobile device is one of them. It would be a pretty good idea in terms of students' practical experience with new technologies in education. Students lack this when they join the work force after their studies; it would certainly help them. Teachers would also certainly look into this along with their theoretical study patterns.' [Uni B - IT Manager]*

Mobile learning researchers from other developing countries such as Mohamad (2012), Sife et al. (2007), Premadasa et al. (2013) and Sari et al. (2008) also recognized the need for raising awareness of mobile learning in the developing world prior to harnessing the potential of this huge opportunity to provide education using mobile devices. The awareness activities could range from an informative seminar to a practical workshop providing the attendees with a hands-on experience with using their mobile devices for learning activities. Concerned stakeholders might be trained in the ethics and standards pertaining to the use of mobile devices for learning so that abuse of mobile learning opportunities may be prevented.

> *'The main difficulty is the lack of realization of mobile learning potential. More seminars and training on this subject can enhance the students' and teachers' awareness. Mobile phone ethics is a big issue. Both students and teachers need extensive training in mobile phone misuse and ethics, norms and values.' [Uni B - Instructional Designer]*

> *'At the moment, it seems impossible to offer a complete course in mobile learning mode but it is possible to offer it partially, though. I stress the importance of raising awareness among students and teachers about learning via mobile devices through workshops and seminars on this topic where they might be able to experience hands-on mobile learning by engaging in learning activities during the workshop.' [Uni C - IT Manager]*

Discussing the current activities and students' motivation regarding mobile learning, one participant mentioned that students have been watching lectures from highly-

ranked universities from developed countries in order to gain insight into a topic and acquire more knowledge.

> *'For example, I have observed some students (who have enabled/purchased larger internet data packages on their mobile devices) watching MIT open courseware material or other learning videos on YouTube during their spare time in university. I think the basic idea of mobile learning is related to distance learning which is not new in Pakistan. The virtual university of Pakistan is already providing education through technology in far-off areas of Pakistan.' [Uni B - Administrator]*

Oliver and Goerke (2008) found that students from developing countries were more highly motivated to engage in mobile learning compared to their colleagues from a developed country. Barker et al. (2005) discussed motivation as one of the biggest factors determining mobile learning adoption in South Africa.

A senior executive from University B mentioned an important direction about the future potential of mobile learning in Pakistan. He suggested that it would be possible to eradicate illiteracy in rural and remote areas of Pakistan harnessing the power of mobile technologies in Pakistan.

> *'I think mobile learning -if implemented in Pakistan at any level- would bridge the gap in terms of literacy in Pakistan, particularly IT literacy.' [Uni B - Administrator]*

There are several examples of projects and trial implementations of mobile learning for underprivileged populations, particularly for children in other developing countries such as India, Kenya and Latin America (Kumar et al. 2010; Kim, Miranda, and Olaciregui 2008). The researcher also intends to undertake a research project involving offline mobile learning as a means of promoting literacy in rural and underprivileged areas of Pakistan as future research.

6.10.2 Negative Uses and Risks

Interviewees pointed out numerous risks and possible negative impacts associated with potential implementation of mobile learning in Pakistani universities. These risks include misuse of mobile phones and mobile internet, wastage of time in the form of over-engagement in social media, pressure placed upon parents to buy expensive devices for learning, students' (particularly for those from remote or rural areas) sudden exposure to information, teachers' increased workload, students missing more lectures and relying solely on mobile learning. Concern about many of these risks also emerged during the focus group discussion sessions with students and teachers; university administrative stakeholders' statements about those risks confirmed that these issues and challenges should be considered carefully before planning to test any pilot implementation of mobile learning in Pakistani universities.

> *'There is an overhead associated with using mobile phones. For example, sending collective messages takes some of the teacher's time. If most of the content is made available online, then students will start skipping lectures with the hope of seeing them later on. As procrastination is common among students, it is probable that students will delay the learning activities until examination. This will affect the uniform and continuous learning load. The learning will be spikier, that is learning too much in very little time and then no learning in longer periods of time. In my point of view, such learning is short lived and do not suffice for true understanding of the concepts. Another concern is excessive communication between the teacher and the students and the students themselves. Students often try to get help as much as possible and do not apply their own brain. Assignment sharing is a big problem in PU. Only a few students actually solve the assignments and the rest of the class get the solution. Also, I do not wish to get phone calls or SMS the whole night before a final exam. Many of these issues can be addressed by devising proper mobile device usage ethics.' [Uni B - Instructional Designer]*

Many of these challenges have been associated with lack of infrastructural facilities, poverty and the underprivileged populations in societies of developing countries, as

indicated by other researchers from developing countries (Mohamad 2012; Sife, Lwoga, and Sanga 2007; Traxler and Kukulska-Hulme 2005). For example, a sudden exposure to mobile internet without any constraints may become a hazard for students who have never previously been exposed to mobile internet. The Dean of Medicine and Dentistry Faculty from University C argued that students might take mobile devices with a high speed mobile internet into their private rooms in university hostels and might be exposed to undesirable material available on the internet instead of using mobile devices for learning purposes only. He suggested that a library, where students could be watched over and monitored, would be the ideal place to begin introducing mobile learning into university environments

> *'I think it might not be so straightforward here as compared to the developed world. Particularly, I am concerned for the students who come from relatively backward backgrounds or areas. I don't recommend giving them mobile devices and letting them go away to their isolated private places such as hostels where no scrutiny can be done of the kind of material they are watching on their mobile devices. They may be introduced to mobile learning in a library situation or common room where they can access learning resources and engage in constructive learning activities under supervision. Undergrads are of the age where they leave home and enter into a freer world, so it is possible that they would engagein non-constructive activities.' [Uni C - Administrator]*

Currently, universities have been using the spam and content filtering process for computer and internet users using university network resources; similar practices could be applied to mobile users using university network resources. In this way, the problem of students watching unethical content could be controlled.

While discussing the data collection activities using mobile devices, one of the participants mentioned that private businesses and engineering firms might now allow students to capture videos or images of their business logic related areas. If students want to use mobile devices for learning and data collection, they must be made aware of privacy policies of the businesses where they go for internships and fieldwork. Security and privacy in reference to mobile learning is an area neglected

by the mobile learning researchers (Ugray 2009). Similarly, copyright, patents and privacy of a firm should be respected by a mobile learning user. There are future research opportunities in this area, particularly within developing countries. For instance, there is need to establish a code of conduct for all mobile learning users across all contexts.

Another challenge discussed by the Dean of the Engineering Faculty in university B was the bureaucratic nature of the university administration processes and systems that it might not be easy to convince higher level management of the university where technology-related innovation to teaching and learning were suggested or planned. Czerniewicz and Brown (2009) have pointed out similar bureaucratic barriers to embracing technology innovation in education put up by public sector education providers in South African universities.

In spite of all of these risks and challenges, the majority of interviewees were positive about the introduction of mobile learning into Pakistani universities.

> *'Mobile devices should have a healthy share in the university's learning environment because they provide an additional but not alternate source of learning. Although there are certain obstacles in their use such as students using them for cheating purposes during examinations; they use them to test the teacher's knowledge, teasing and challenging teachers by asking difficult questions during the lecture in the classroom, wasting time and money when they do not actually engage in learning activities and just engage in social networking all the time. However, these obstacles can be controlled by efficient monitoring.' [Uni C - Instructional Designer]*

6.10.3 Socio-Cultural Factors - Summary of Discussion and Findings

Participants' ideas about the need for creating awareness of mobile learning in Pakistani universities and students' motivation to be involved in mobile learning are summarized in this section. The following list also includes a summary of the

possible risks and challenges associated with potential mobile learning implementation in Pakistani university environments:

- The majority of the interviewees were focused on the issue of creating awareness about use of mobile technologies in teaching and learning environments prior to any attempt to test mobile learning initiative in Pakistani university environments.

- An awareness campaign for mobile learning would be required for teachers, students, university administrators and managers, instructional designers, course leaders, librarians and parents of enrolled students in order to make them aware the benefits of mobile learning.

- Being motivated to engage in mobile learning, during their free time on campus or while traveling to and from university on public transport, students have been watching lectures from highly-ranked universities from developed countries in order to gain insight into a topic and acquire more knowledge.

- Mobile learning could be used to eradicate illiteracy in rural and remote areas of Pakistan.

- A number of risks and challenges pointed out by interviewees include students' engagement in merely social networking activities, pressure placed upon parents to buy expensive devices for learning, teachers' increased workload and students' compromised attendance to the fact-to-face lectures.

- However, in spite of all those challenges, all of the participants in this study including interviewees, teachers and students, wanted to introduce and test mobile learning in Pakistani university environments.

- Mobile learning researchers from other developing countries have mentioned similar risks and challenges to mobile learning implementations in developing countries.

6.11 Chapter Summary

This chapter consists of discussion and findings from the analysis of individual interviews with key administrative stakeholders from three Pakistani universities. Administrative stakeholders included instructional designers, IT managers and policy making administrators such as Deans of faculties and directors. Participants showed a positive and welcoming attitude toward the potential future implementation of mobile learning in Pakistani university environments. Participants shared their experiences and observations of using and facilitating informal mobile learning activities in universities in Pakistan. Summary of key findings out of data analaysis of administative stakeholders' interview have been presented in Figure 31.

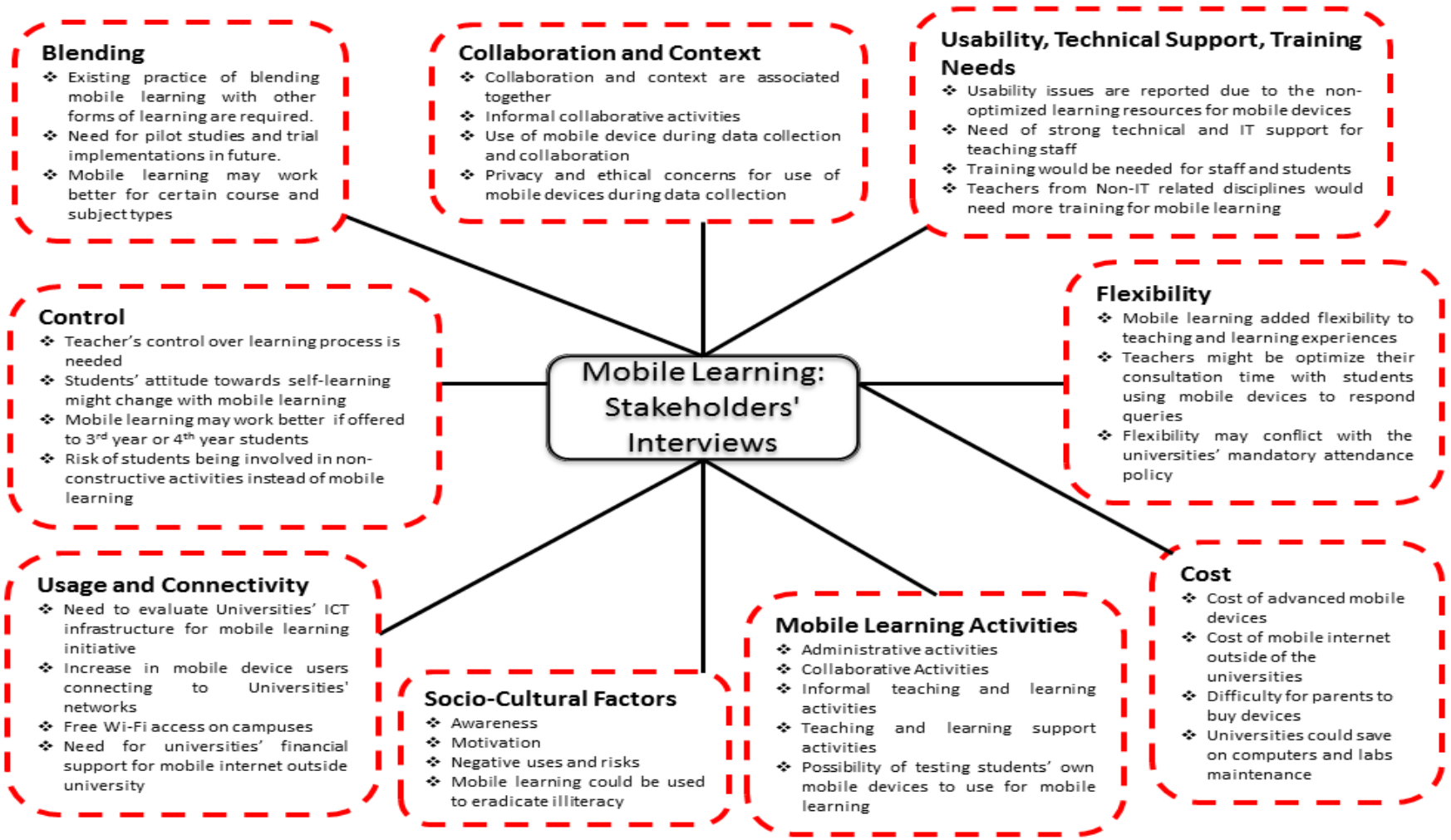


Figure 31: Summary of findings from Stakeholders' Interviews

Apart from voicing positive sentiments and opinions, the participants indicated their concerns about several issues that might become obstacles to the introduction of mobile learning in Pakistani university environments. Many of these issues are associated with the socio-cultural background of Pakistan as a developing country such as the cost of mobile devices and mobile internet, redesigning or upgrading of learning content for mobile devices, provision of training to teachers and students, and raising awareness of mobile learning prior to introducing it in Pakistani university environments. Any potential mobile learning initiative in Pakistani university environments would need careful planning that addresses the challenges associated with it and a pilot implementation would be necessary. It is also important to note that findings from the interviews with stakeholders corroborate the findings from focus groups of teachers and students presented in the two previous chapters.

CHAPTER 7 MOBILE LEARNING FRAMEWORK FOR UNIVERSITIES IN PAKISTAN

7.1 Introduction

The results, discussion and findings of this study were presented in Chapters 4, 5 and 6. Chapters 4 and 5 described the outcomes of the data analysis for the student and teacher focus group sessions respectively, whereas Chapter 6 contained the results and discussion based on interviews with key administrative stakeholders in selected Pakistani universities. Based on the analysis of the results and findings presented in previous three chapters, a Mobile Learning Framework for Universities in Pakistan has been formulated in this chapter. This chapter discusses how the new Mobile Learning Framework (MLF) for Universities in Pakistan is different from the initial Mobile Learning Conceptual Model which was created based on a comprehensive literature review that was used to inform the research design and data analysis. Answers to the research questions are presented in Section 7.4 followed by the chapter summary.

7.2 The Initial Mobile Learning Conceptual Model

The initial Mobile Learning Conceptual Model (see Figure 32) was an outcome of the extensive review of mobile learning literature. People, Interactivity and Technology were identified as three focus areas within the mobile learning literature. In this initial mobile learning conceptual model, the People category included students, teachers, administrators, educational managers, instructional designers and IT support staff. Interactivity referred to the mobile learning characteristics which would assist students and teachers to interact in terms of collaboration, usability, blending, content and control. The Technology category represented the

characteristics associated with mobile devices and technologies such as network connectivity, flexibility, technical support and costs associated with the technology.

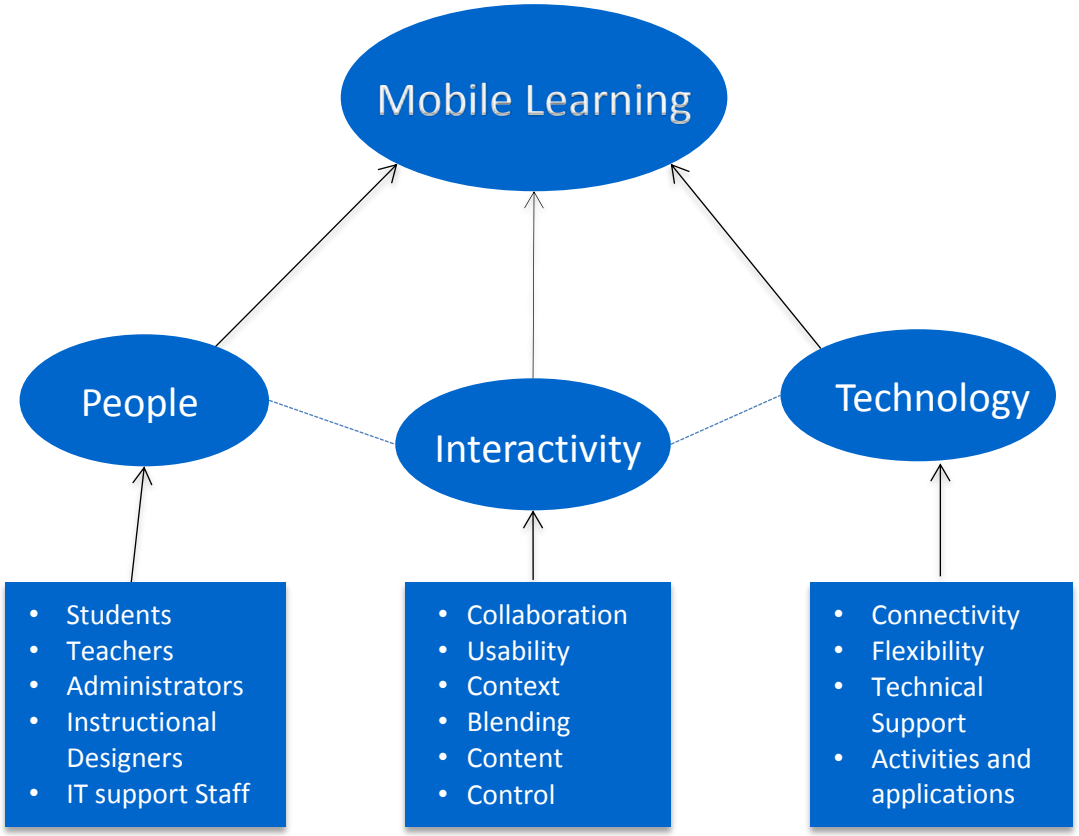


Figure 32: Mobile Learning Conceptual Model

(Adapted from Danaher et al. (2009), Sharples et al. (2005), Barker et al. (2005) and Koole (2009)

7.3 New Framework vs. Initial Model

The initial mobile learning conceptual model (see Figure 32) was the outcome of the literature review. The main aim of the initial mobile learning conceptual model was to inform the research design for this study. Based on the literature review, the important stakeholders and mobile learning characteristics were included in the initial mobile learning conceptual model. Based on the conceptualization derived from the literature review, the instruments for data collection were prepared. The data analysis and structure of the results and discussion chapters were also guided by the initial mobile learning conceptual model. As a result, a new Mobile Learning Framework for Universities in Pakistan, as shown in Figure 40 has been enriched by

the data collected from a number of stakeholders and beneficiaries from selected Pakistani universities. The outcomes of the data collection and analysis conducted during this study reveal a number of changes to the way the initial mobile learning conceptual model was presented; those changes have been reflected in a new mobile learning framework for Pakistani universities.

A detailed argument is required to highlight how the new Mobile Learning Framework for Universities in Pakistan is different from and better than the initial Mobile Learning Conceptual Model. Therefore, the following sub-sections include a discussion of each category from the new framework based on the findings of this research, and provide a comparison with the initial model. The discussion is concluded by a formulation and presentation of the new Mobile Learning Framework for Universities in Pakistan (Figure 40).

A number of insights have been used as input to the discussion so that the contribution of this research will be clearly identified. These insights include: 1) why the new framework is preferred and better than the initial model; 2) the basis and evidence for the changes that have been made to the new framework; 3) how the new framework will be used based on the outcomes of data analysis; 4) how the new framework is effective and productive; and 5) whether the new framework will support universities in Pakistan in their quest to incorporate mobile learning as part of the university's teaching and learning initiative. Applying these insights to the discussion of new framework and the initial model will also assist in answering the research questions. The following sub-sections include separate discussions focussing on each category (People, Interactivity and Technology) presented in the initial model to the similar category in the new Mobile Learning Framework of Stakeholders, Interactivity and Technology.

The New Mobile Learning Framework for Universities in Pakistan is color-coded in order to differentiate newly-added or changed categories and characteristics based on the outcomes of this research. Categories and characteristics presented in blue are similar to those initially conceptualized from the literature review; however, each category and characteristic in the new framework might be named similarly to those available in the literature but data from this research not only confirms with what is available in the literature in terms of mobile learning characteristics, but also

represents the perceptions and expectations of students, teachers and administrative stakeholders from Pakistani universities (Chapters 4, 5 and 6 for detailed discussion) which constitutes an important contribution of this research. Categories and associated characteristics presented in red represent the new findings and other key contributions of this research to the body of knowledge in mobile learning field.

7.3.1 Mobile Learning Framework – Stakeholders Category

In this section, changes to the People/Stakeholders category will be discussed and presented in the light of findings of this research presented in the previous three chapters. The outcomes of the data analysis of focus groups and interviews show that there were a number of additional stakeholders potentially involved in the mobile learning environment in Pakistani universities. Initially, Students, Teachers, Administrators and Instructional Designers were included in the People Category in the initial model (see Figure 32). However, data analysis (from Chapters 4, 5 and 6) revealed that there are other stakeholders potentially playing a substantial role in any mobile learning initiative in Pakistani university environments. Mobile learning content developers, telecommunication service providers and parents or guardians of the students were additional stakeholders in the new framework (see Figure 40).

First of all, the name of this particular category has been changed from 'People' to 'Stakeholders' for certain reasons. Newly-added people in the domain of mobile learning include not only individuals but also companies and departments. For instance, telecommunication providers usually are big companies, not individuals; similarly, mobile learning content developers may represent individuals or software development companies. IT staff also represent many staff in universities' IT departments including managerial level to technical support staff. Therefore, 'stakeholders' is an appropriate title for this category.

Participants in the research stated a number of reasons why these newly-added stakeholders were important to the future of mobile learning in Pakistani university environments. For instance, during the data collection phase and the analysis of the individual interviews, it was found that the word 'administrators' in the initial model (see Figure 33) did not truly represent the role of people who were interviewed from Pakistani universities; therefore the administrators were replaced by senior

executives in the new framework (Figure 34). It is important to note that the term 'senior executives' has been used to represent the key stakeholders or higher management personnel of the universities involved in university-wide policy making and administrative decisions.

Old Model

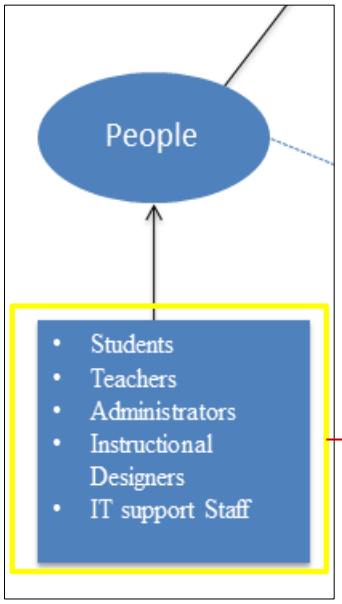


Figure 33: People Category: Initial Model

New Framework

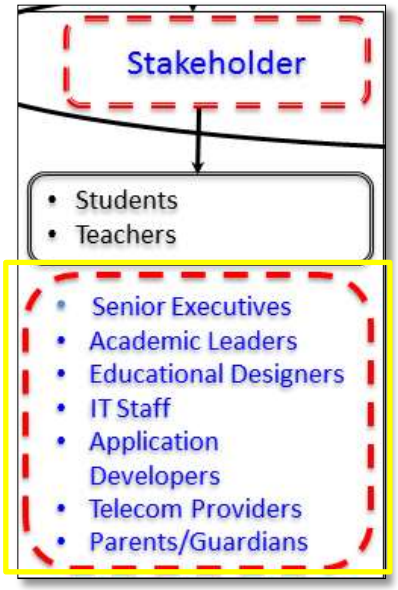


Figure 34: Stakeholders Category: MLF

The term 'instructional designers' in the initial model was adapted from the literature which - in the case of Pakistani universities - did not solely represent the role of people who are involved in instructional design and course leadership. As a result of data analysis, stakeholders who were interviewed in the role of instructional designers were, , grouped as educational designers and academic leaders in the new framework. Basically, during the interviews, it was revealed that these stakeholders were not only involved in instructional design, but were also playing several other important roles in academic leadership such as course leaders, subject co-ordinators and student advisors. In the case of mobile learning, in the light of findings of this research, it is recommended that the role of educational designers would be distinct from that of other academic leaders. Therefore, universities might need to re-evaluate the traditional model of staffing in this area and recruit the experts in the

field of educational design with a strong background in teaching and learning pedagogies in order to develop or redesign the learning content according to the mobile learning pedagogy requirements.

The analysis of data collected from focus group discussions and interviews showed that the participants had considered that the services of mobile learning application developers would be required along with the educational designers to assist academic leaders to convert mobile learning content or mobile learning activities into mobile applications or relevant mobile device compatible format.

In particular, IT managers in Pakistani universities strongly recommended (refer to Chapter 6 for details) that universities might need to recruit educational designers as well as mobile learning application development staff for a successful implementation of mobile learning initiative in universities. Alternatively, universities could outsource the mobile learning content design and mobile learning application development to third party educational design and mobile application development companies.

Basically, the decision for in-house educational design and application development or outsourcing depends upon a number of factors including universities' existing practices in this regard, capacity, expertise of existing staff, scope of the mobile learning initiative, budget and timeline. For instance, one of the participant universities already had an in-house software development and production department working on the development and maintenance of the university's information systems including the learning management system and other management information systems. In contrast, the senior executives of the other two universities did not divulge information about their universities' in-house development or outsourcing strategies. In the case of in-house development choice by the universities, the mobile learning initiative in the university environments would follow a traditional Information Systems Development Life Cycle model which includes planning, analysis, design, development, and maintenance phases. This means that universities might need to recruit appropriate staff for the mobile learning initiative including ICT project manager, educational designers and application developers along with the participation of many of the existing staff members including senior executive, academic leaders and teaching staff.

Another stakeholder added to the new Mobile Learning Framework is telecommunication providers. According to the research participants, telecommunication providers might play a key role in determining the cost and availability of mobile internet for students and teachers in a mobile learning environment. Students and teachers suggested that university senior management negotiate with telecommunication companies to negotiate for a cheaper rate for high quality, fast mobile internet for students and teachers for mobile learning purposes. Therefore, this new category of stakeholders was added to the new Mobile Learning Framework for universities in Pakistan.

Another stakeholder included in the new framework was the parents or guardians. It was evident from the data derived from focus groups and interviews that the involvement of the parents or guardians of students enrolled and studying in Pakistani universities is crucial since these people are usually the main source of funding for university education in Pakistan. For instance, as discussed in Chapter 6, a senior executive from University C mentioned that parents had been actively involved in the student learning journey and were regularly being informed by the university, of the students' progress. Moreover, students themselves (in the focus group discussions as mentioned in Chapter 4) stressed the importance of the involvement of parents or guardians in the consultation process for mobile learning implementation in the universities as well as being informed of students' engagement in mobile learning.

Another important adjustment was that the term 'IT support staff' was changed to 'IT staff' for this particular stakeholder group in the new framework. Interviews with IT managers revealed (refer to Chapter 6 for details) that any mobile learning initiative in Pakistani universities would need the strong support of universities' IT departments including IT managers, network staff and IT support staff for resolving ongoing queries of users involved in teaching and learning with mobile devices. Hence, all of these stakeholders have been grouped and represented as IT Staff in the new framework.

7.3.2 Mobile Learning Framework – Interactivity Category

In this section, the category of Interactivity and relevant mobile learning characteristics will be discussed with reference to the initial model (see Figure 35) and the changes occurred in the new framework (see Figure 36) as a result of the findings of this research.

A number of changes were made to the mobile learning characteristics or themes grouped under the interactivity category in the light of findings of this research. For instance, the responses of the research participants as discussed in Chapters 4, 5 and 6 indicated that the usability of mobile devices was more related to the physical interface of mobile devices than to the interaction occurring among students and teachers. Participants reported usability issues such as small screen, tiny keypad and short battery life as major issues associated with mobile device usability for learning.

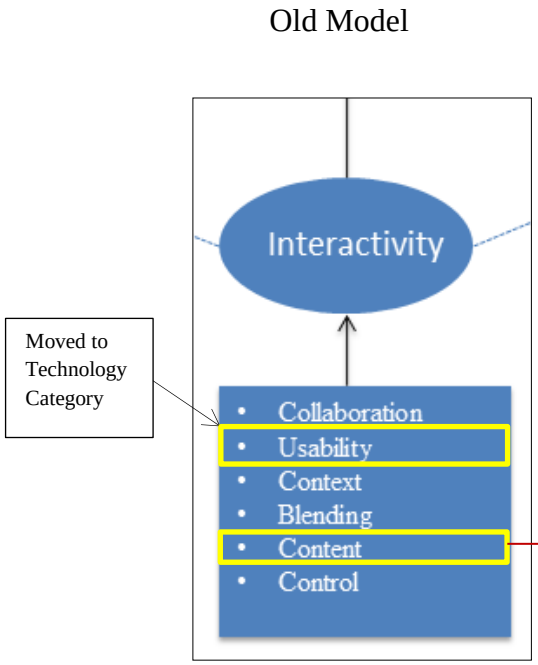


Figure 35: Interactivity Category: Initial Model

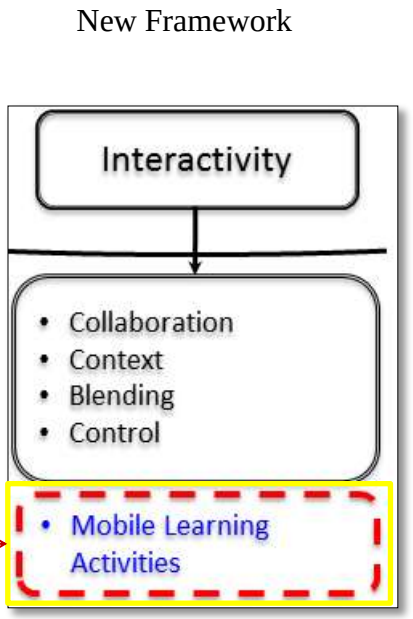


Figure 36: Interactivity Category: MLF

These issues indicate that the interface and the physical capabilities of mobile devices were important to the participants in relation to usability. Therefore, usability was moved from the interactivity category to the technology category in the Mobile Learning Framework for Universities in Pakistan.

The inclusion of 'mobile learning activities' was another addition or change made to the new framework from the initial model. 'Content' was the term used in mobile learning literature and was presented and discussed in Chapter 2. It is important to mention that mobile learning activities are actually a practical illustration of the learning content; therefore, the notion of mobile learning activities in the new framework still implicitly represents the mobile learning content. Findings of this research show that participants such as students and teachers (Chapter 4 and 5 respectively) were more focused on reporting the mobile learning activities in which they had been involved. Academic leaders and IT managers, however, used several synonyms such as content, learning material and mobile learning activities during the interviews (Chapter 6) when discussing the potential redesign of learning content for mobile learning environment in Pakistani universities and their observations of students' and teachers' engagement in certain mobile learning activities. According to the data collected and analyzed, the term 'mobile learning activities' seemed to be a more appropriate interpretation and representation of the participants' perceptions; therefore, 'content' was removed and replaced by 'mobile learning activities' in the new framework. Previously, the term 'mobile learning activities and application' was used. During the data analysis, it was observed that participants have been using 'activities' and 'application' interchangeably to point out mobile learning activities. Therefore, in the MLF, the term was used as 'mobile learning activities'.

As outcomes of data analysis for students' and teachers' focus groups, several categories of mobile learning activities emerged. These categories include administrative activities, collaborative activities, informal teaching and learning activities and teaching and learning support actitivities (refer to Section 4.10 in Chapter4 and Section 5.11 in Chapter 5 for details). Mobile learning activities in MLF encapsulate these categories of activtiess that emerged from the data analysis.

Collaboration, context, blending and control remained unchanged in the new framework (see Figure 36) and presented as they were in the initial model (see Figure 35) derived from the literature review. However, the findings of this research reveal many more perceptions and expectations of participants from Pakistani universities for each of these characteristics than those that emerged from the literature. Some of those perceptions and expectations were similar to those found in

the mobile learning literature but many pertained exclusively to Pakistani university environments; that is one of the strong arguments for the new framework to be used in Pakistani university environments in future.

Collaboration was one of the most discussed themes during the course of the data collection across all groups of participants including students, teachers and administrative stakeholders (Chapters 4, 5 and 6). Students and teachers reported numerous examples of their formal and informal collaborations for study, projects, assignments, queries, conference calls, and Skype meetings using a number of collaboration tools on mobile devices such as voice calls, SMS, instant messaging, video messages and social media platforms such as Skype, Facebook and yahoo groups. These findings from this research confirm the mobile learning literature and presentation of this particular characteristic in the initial mobile learning conceptual model (Figure 35). Therefore, collaboration has been presented in the Mobile Learning Framework for Universities in Pakistan similar to the initial model.

Context was another important mobile learning characteristic as indicated in Chapter 2 from literature review. Findings of this research confirmed those in the literature regarding the use of mobile devices for learning across multiple contexts (Chen et al. 2003; Santos et al. 2010; Song 2011; Thüs et al. 2012). For instance, during this research, students and teachers reported (Chapter 4 and 5) that they had been using mobile devices during field work, internships, data collection, in the clinics in rural areas and visiting relatives in rural areas during the holiday period to assist with their learning as well collaboration with teachers in order to seek their advice on the projects and assignments. Context and collaboration were closely related and discussed by administrative stakeholders during interviews. A few studies in mobile learning literature also indicate that collaboration and context have a strong relationship in a mobile learning environment (Spikol, K., and M. 2009). A future study might be able to further investigate the relationship between collaboration and context exclusively. However, in the new Mobile Learning Framework for Universities in Pakistan, context has been presented separately from collaboration although the relationship has been discussed in Chapter 6.

Blending mobile learning with existing forms of learning such as face-to-face learning and e-learning was an important theme in the mobile learning literature

(Ally 2009; Chao and Chen 2009; Parsons 2011; Peter and Barney 2007). The findings of this research confirm those in the literature and indicate that blending would be an appropriate way to introduce mobile learning in formal teaching and learning environments in Pakistani universities (Chapters 4, 5 and 6). According to the participants' experiences of informal mobile learning, it was found that the practice of blending mobile learning with face-to-face learning was already taking place in Pakistani universities. However, formal inclusion might be more complicated as it would involve certain policy making on the part of university senior executives and academic leaders.

The notion of control or the teacher's role in the learning process was another theme that emerged from mobile learning literature as a key ingredient of the mobile learning environment which was validated by the findings of this research (Chen et al. 2010; Fernandez, Simo, and Sallan 2009; Jeffrey 2009; Wang and Ryu 2009). However, this research revealed a significant finding of another dimension of control from a developing country's perspective which was not represented in the mobile learning literature. All of the participants in this research including students, teachers and administrative stakeholders (Chapters 4, 5 and 6) emphasized the teacher's control of the learning process in Pakistani university environments. The majority of participants perceived that students might be distracted and not engaged in learning if teachers had less control. However, academic leaders believed that teachers would have more opportunities to experiment with independent learning or student-centred learning in a mobile learning environment in Pakistani universities.

7.3.3 Mobile Learning Framework – Technology Category

In this section, the changes and additions to the technology category in Mobile Learning Framework for Universities in Pakistan (See Figure 38) that make it different from the initial model (See Figure 37) are discussed as are the findings confirming the literature studies in mobile learning.

Usability was another characteristic added to the technology category. As discussed in Section 7.3.2, participants' responses showed that usability of mobile devices is more associated with the physical capabilities and user interface of mobile devices than the facilitation of interactivity among different stakeholders in teaching and

learning environments. Therefore, based on the outcomes of data analysis, usability has been shifted from the interactivity category to the technology category in the new Mobile Learning Framework for Universities in Pakistan (see Figure 38). Further, the findings of this research show that users' prior experiences with the technology reduce the number of usability issues reported by them.

Another important change was made with the characteristic named 'activities and applications' in the initial mobile learning conceptual model (Figure 37); this was removed from the technology category and added to the interactivity category as mentioned previously in Section 7.3.2. Based on the review of mobile learning literature and techno-centric perspectives (Sections 2.3 and 2.6.8 in Chapter 2), it was perceived that mobile learning activities and applications depend merely on the availability of technology. In particular, the administrative tasks performed by students and teachers in literature studies justified placing 'activities and applications' on the technology side at the time of conceptualizing the initial mobile learning model (Figure 32) as a result of the literature review.

Old Model

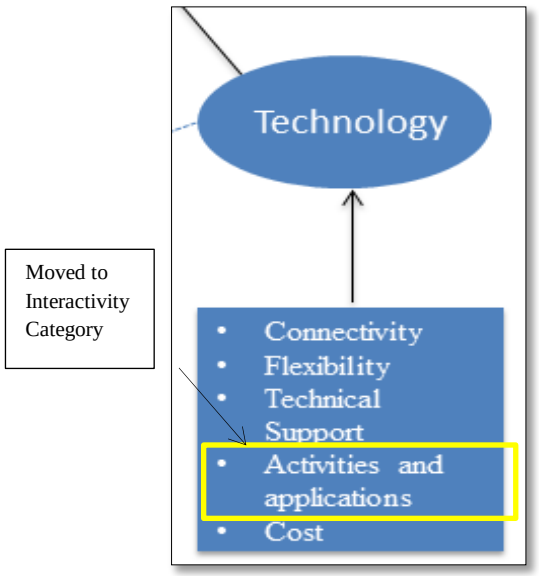


Figure 37: Technology Category: Initial Model

New Framework

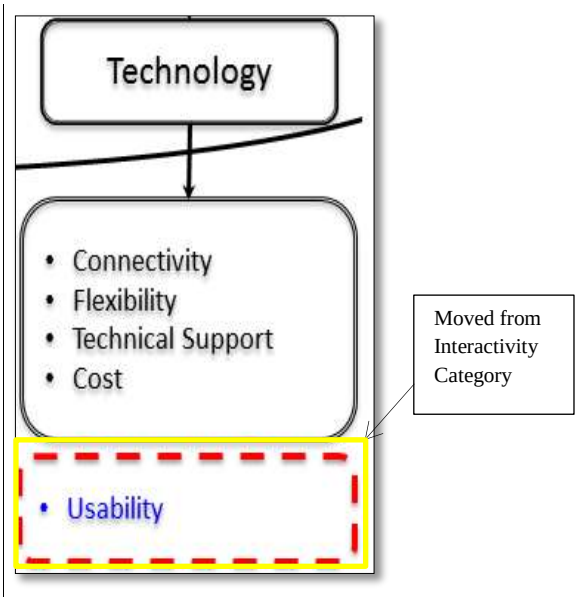


Figure 38: Technology Category: MLF

The data collected during this research suggests that students and teachers do not use their mobile devices merely for administrative tasks such as viewing or updating attendance records and examination results; in fact, they are involved in a range of teaching and learning activities informally such as collaborating on projects and assignments and for data collection during field trips. The enhanced engagement in teaching and learning activities rather than using mobile devices only for administrative tasks show that stakeholders in Pakistani university teaching and learning environments perceived mobile learning to be more teaching and learning focused rather than being merely a techno-centric accessory in university environments.

As argued earlier in Section 7.3, there are certain mobile learning characteristics conceptualized from the literature review in the initial mobile learning conceptual model (Figure 32) which remained unchanged in the new Mobile Learning Framework for Universities in Pakistan (Figure 40). Findings of this research not only confirmed those in the literature but also added new insights in terms of the perceptions and expectations of the research participants. In the category of technology under discussion in this section, connectivity, flexibility, technical support and cost are the characteristics which were retained in the new Mobile Learning Framework for Universities in Pakistan (Figure 38) similar to the initial conceptualization from the literature review in the initial Mobile Learning Conceptual Model (Figure 37). The next part of this section includes the discussion of these mobile learning characteristics in the light of perceptions and expectations of participants from Pakistani universities. In addition, a rationale for grouping these characteristics together under the technology category has been included in the discussion.

The outcomes of the data analysis for this research show that connectivity options for mobile devices such as mobile internet and Wi-Fi might affect the way students could connect with universities' learning management systems to access the learning resources, download learning material on their mobile devices and collaborating with peers and teachers. Mobile learning literature shows similar evidences from other studies (Economides and Grousopoulou 2009; Goyette 2005; Kukulska-Hulme 2012). Therefore the findings of this research confirm these literature studies. In

addition to confirming the literature findings, certain insights have been gained through the perceptions and expectations expressed by research participants. For example, students from Pakistani universities perceived that the quality of connectivity was linked with the cost of connectivity and the availability of sophisticated smart mobile devices to the students (Section 4.7, Chapter 4).

Students also argued that buying an expensive monthly mobile internet package or plan guaranteed a high speed mobile internet and smooth connectivity for users which is necessary for successful mobile learning engagement, but it was not affordable for all students in Pakistani universities. Similarly, according to the students who participated in focus groups, connectivity was better and smoother on sophisticated smart devices as these devices also support Wi-Fi connectivity; however, many of the participants expressed explicitly that they could not afford to buy those devices.

On the other hand, teachers from Pakistani universities did not focus on the cost of connectivity; instead, they discussed the availability and quality of mobile internet and cellular technologies in Pakistan such as GPRS, EDGE and 3Gs as well as network coverage in remote areas. Teachers argued that university-provided Wi-Fi was the only viable option for students and teachers but it constrained them to be on university premises which may become a big obstacle in harnessing the benefits of mobile technologies of teaching and learning environments in Pakistani universities. Although, university executives highlighted that universities' provided free Wi-Fi and fast internet for staff and students but they did not acknowledge students' expectations of the university in terms of subsidizing the cost of mobile devices and mobile internet off campus in order to be involved in mobile learning. IT managers cautioned that universities' current ICT infrastructural arrangement had not been tested for mobile learning capacity and stressed the need for a trial implementation of mobile learning in Pakistani universities in future. Academic leaders stated that connectivity might be a key issue to be considered when designing future mobile learning initiatives for Pakistani university environments.

In spite of all aforementioned issues associated with connectivity and costs, all of the stakeholders who participated in focus groups and interviews agreed that mobile learning would add flexibility to the teaching and learning environments in Pakistani

universities. These findings confirm the mobile learning literature findings regarding the flexibility and mobility that mobile devices bring to the teaching and learning arenas around the globe (Brown 2009; Chao and Chen 2009; Kukulska-Hulme 2010; Kukulska-Hulme and Traxler 2005; Petrova 2010; Schneider, Bleimann, and Stengel 2009; Wang and Ryu 2009).

On the matter of technical support, there were different perceptions among students and teachers. Students did not show a need for ongoing technical support other than for minor issues, whereas teachers insisted that there was a need for the provision of ongoing technical support for issues such as mobile device configuration with the university's network and assistance with learning activities or content management for mobile devices. Similar to the teachers' perceptions and expectations, administrative stakeholders including senior executives, academic leaders and IT managers stressed the importance of having ongoing technical support for teachers and students if any mobile learning initiative were to be planned for Pakistani universities. There might be several reasons for the difference between students' and teachers' perceptions regarding the need for technical support. Sife et al. (2007) argue that students in developing countries become self-sufficient in resolving minor technical issues due to the unavailability of formal technical support resources. Students participating in focus groups in this study mentioned that they relied upon peer support to resolve minor day-to-day technical issues instead of going to the university's technical or IT support department for assistance. Students' current experiences of downloading audio and video material and engagement in learning activities and social media make them capable of resolving day-to-day technical issues. On the other hand, many of the teachers, particularly those without an IT or Engineering background experienced difficulties when using modern ICTs including advanced mobile devices. Teachers also needed ongoing technical support for mobile learning content design, development and management.

7.3.4 Additional New Findings from this Research: Socio-Cultural Factors

Beside the main categories and themes conceptualized from the literature review in Chapter 2, the outcomes of data analysis for this research revealed several additional

new findings which constitute a major contribution of this research to the literature. Many of these new findings represent the perspective of Pakistani universities' environments, perceptions and expectations of participants and the socio-cultural factors impacting on any future mobile learning initiative in Pakistani universities.

Participants including students, teachers and administrative groups in Pakistani universities did have differences in their perceptions and expectations of many of the mobile learning characteristics discussed earlier in this chapter; however, all of the groups of participants had similar views about certain factors which represent challenges within the Pakistani socio-cultural environment in particular and the typical socio-cultural environment of a developing country in general. These socio-cultural factors include a need to create awareness of mobile learning and its potential benefits, harnessing the motivation for mobile learning among students of universities, realizing the importance of training for the students and particularly for teachers, acknowledging the socio-economic and educational backgrounds of student populations in the universities and risks of negative exploitation of mobile learning opportunity and resources by all involved stakeholders. As additional new findings of this research, these themes emerged from the data analysis and were grouped as socio-cultural factors to be included in the new Mobile Learning Framework for universities in Pakistan (see Figure 39).

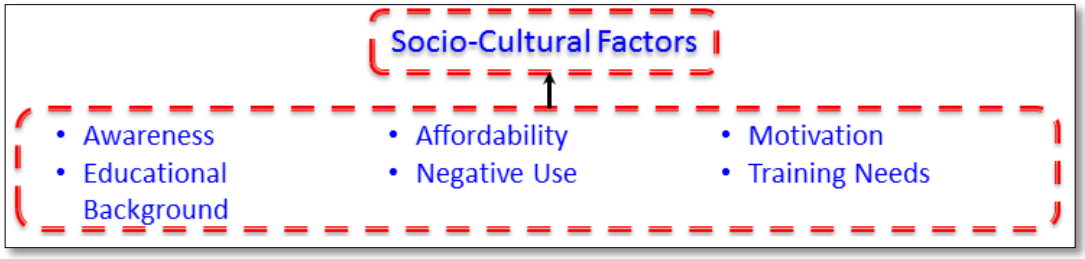


Figure 39: Socio-Cultural Factors impacting mobile learning in Pakistani universities

The need for creating awareness was expressed by the majority of research participants including focus groups and interviewees. According to the participants, the audiences for awareness campaigns for mobile learning in Pakistan could range from stakeholders in teaching and learning environments to people in the wider community such as parents and families of students.

Some of the teachers mentioned that it would be difficult to convince people in senior executive positions and senior academic positions within the universities of the need and potential of mobile learning in Pakistani universities due to the fact that they find it difficult to familiarise themselves with modern technologies. Many participants suggested using mobile devices to raise the awareness of mobile learning by creating an application for awareness or to include a learning activity to demonstrate how mobile devices could add flexibility to the university environments in Pakistan. Although there are fewer literature references for these socio-cultural factors from developing countries, Kumar et al. (2010) and Alzaza et al. (2011) mentioned the need for creating awareness in India and Malaysia before embarking on mobile learning implementation projects in these countries.

The motivation of the students and teachers to be engaged in mobile learning activities was another factor which has relevance to the social and cultural notions. For instance, Oliver and Goerke (2008) found that university students from an African country were more motivated and enthusiastic about engaging in mobile learning than their Australian counterparts. Similarly, Barker et al. (2006) conceptualized motivation as one of the factors of mobile learning adoption in South Africa. The outcomes of the data analysis for this study indicate that participants from Pakistani universities in this study were motivated to embrace mobile learning in formal and mainstream university teaching and learning despite the number of problems and challenges they mentioned related to costs, connectivity and usability. The motivation of participants, particularly students and teachers, was attributed to reasons such as their experiences of informal mobile learning activities in collaborations for projects and assignments, using the dictionary, and uploading and downloading learning material. Many who did not already possess a smart mobile device due to affordability issues were keen to own a smart mobile device and be able to engage in mobile learning activities and collaborate with peers and teachers. Although English is the second language for Pakistani people, English is the medium of instruction in Pakistani universities and higher education institutions. Therefore, for students and teachers in Pakistani universities, the availability of language learning resources such as dictionary and encyclopaedia access through the internet was another contributing factor to their motivation for mobile learning.

The training needs of students, teachers and administrative stakeholders were identified as a precursor to any formal implementation of mobile learning in Pakistani universities. Although training is needed for any mobile learning initiative in a developed country, training requirements for a developing country environment such as Pakistan are extensive, immense and ongoing. Therefore, 'training needs' has been grouped together with the other socio-cultural factors impacting on potential mobile learning implementation in Pakistani universities.

The outcomes of the data analysis for this study show that participants identified different types of training needs for each group of stakeholders. For instance, students might need a one-off training session at the start of the semester, whereas teachers needed training at the beginning as well as ongoing training and support in order to keep up to date with changes in technology, and deal with technical or configuration issues with devices to the network, designing, creating and managing the learning content for mobile devices. Some of the teachers who did not belong to techno-centric disciplines might need training in order to feel comfortable with the latest mobile technologies. Similarly, some senior professors and academics might also need to be trained in the use of the latest mobile technologies to cope with the technological intrusion in teaching and learning environments in Pakistani universities. IT staff, particularly the staff responsible for providing ongoing IT and technical support to the users of mobile teaching and learning, would require training for themselves to keep up to date with the changes in the technologies.

Affordability emerged as one of the major issues in the future implementation of mobile learning in Pakistani universities. According to the participants' experiences and perceptions, there was a major socio-economic divide among the university students in public sector universities in Pakistan. Admissions for undergraduates are strictly merit-based in public sector universities where tuition fees are affordable and the majority of the student population come from middle class and relatively lower socio-economic backgrounds. Ali et al. (2013) argue that usually these students have been educated in public schools for low income families, and in relatively backward areas of the country and rural areas where schooling is of very poor quality (Memon, Joubish, and Khurram 2010). A small minority of students enrolled in public sector universities come from relatively stronger socio-economic backgrounds. In addition,

these students have a strong secondary school background in expensive private schools and bring their own expensive technological devices to university from home.

During their focus group discussions, many students voiced directly and indirectly that they had affordability issues when it came to buying expensive devices for learning or paying for costly mobile internet. It was observed that many of the students from lower socio-economic backgrounds also reported more usability issues due to their lack of experience with smart mobile devices. Interestingly, these students were equally or a little more enthusiastic and motivated to be engaged in mobile learning. They suggested that universities should assist them to purchase smart devices or provide subsistence and afford good quality mobile internet so that they could experience informal or formal mobile learning in the same way as some of their peers were doing at that time. Teachers and administrative stakeholders did not mention the affordability and educational background issues for them, although a few teachers saw the need for training for those who belong to non-technical disciplines; however, they duly acknowledged the diversity of the socio-economic backgrounds within the student cohorts in Pakistani universities. Some of the teachers warned that if mobile learning initiatives are implemented without acknowledging and resolving this issue, the mobile learning project might fail and contribute to worsening this socio-economic gap between student cohorts in Pakistani universities, impacting upon the wider community as a result.

Participants from the focus groups and administrative stakeholders' group unanimously stressed the risks associated with the abuse of opportunities and resources provided to students and teachers to engage in mobile learning. For instance, students could use mobile devices for purely social and entertainment purposes instead of learning activities. Similarly, students might pressurize their parents to buy expensive devices for mobile learning which they might not afford. Students would also be at risk of being exposed to undireable content on their mobile devices if not monitored properly. Teachers also believed that there would be increased workload for them engage in mobile learning as well as maintain their teaching in existing face-to-face mode. Teachers also warned that students would

miss face-to-face lectures in lieu of remotely accessing learning resources in mobile learning mode.

Participants in this research strongly voiced the need for regulations to be established and enforced if mobile learning is to be introduced in Pakistani university environments. From the results of this research, it seems imperative that a code of conduct for engagement in mobile learning needs to be established before any mobile learning implementation can be planned in Pakistani universities in future. In mobile learning literature, no such code of conduct for mobile learning engagement exists despite researchers such as Mohammad (2012) and Sife et al. (2007) pointing out some of these issues as challenges to the successful implementation of mobile learning in developing countries.

7.3.5 Mobile Learning Framework for Universities in Pakistan

In this section, the new Mobile Learning Framework for Universities in Pakistan is presented in Figure 40. The details of the individual components of the framework have been discussed in depth separately in the previous three sections; this section presents the rationale for the framework as a whole, the linkage of all categories and characteristics with each other, and possible generalization of the framework to other developed or developing countries.

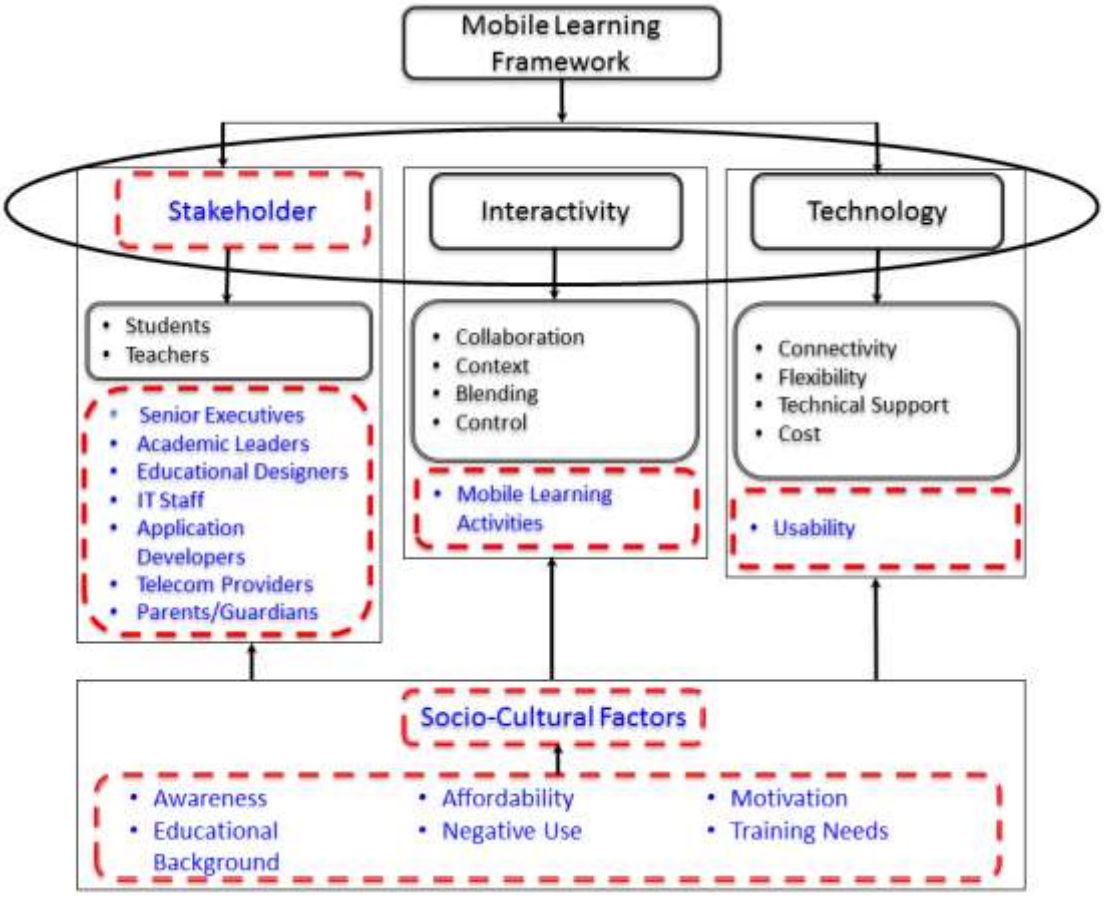


Figure 40: Mobile Learning Framework for Universities in Pakistan

The new Mobile Learning Framework for Universities in Pakistan (Figure 40) provides a comprehensive set of mobile learning characteristics, relevant stakeholders and socio-cultural factors as necessary components of any mobile learning design and implementation in Pakistani university environments.

In fact, this framework has a dynamic structure which includes multiple components that can be detached and viewed or used independently of other components for certain purposes. For instance, the upper part of the framework (see Figure 41) can be used as an abstract view of mobile learning irrespective of developed or developing world. These main categories are the basic building blocks of mobile learning and are equally important to university environments in general for developing or developed countries.

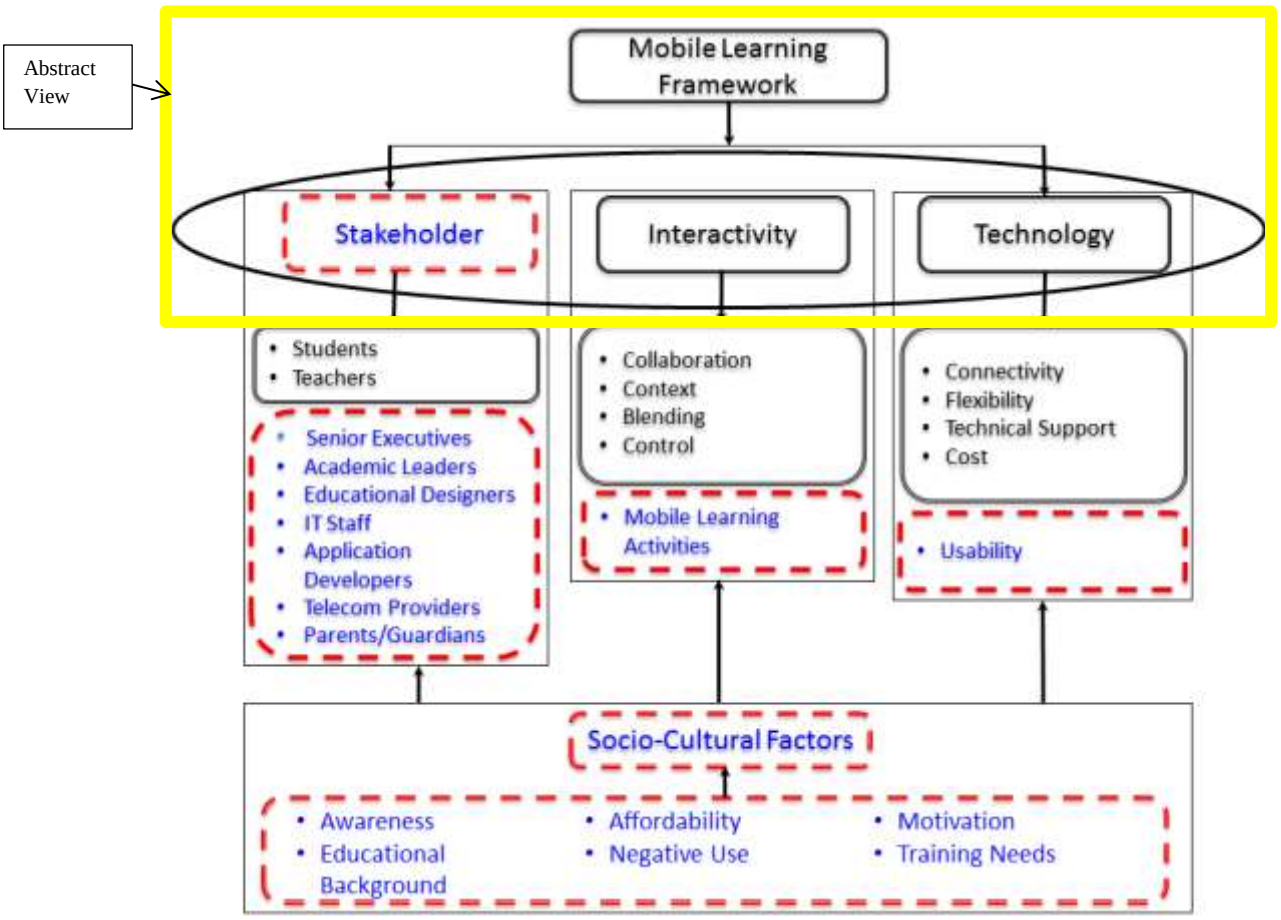


Figure 41: Abstract View of Mobile Learning Framework for Universities in Pakistan

The middle part of the framework, as shown in Figure 42 constitutes the elements which are necessary when developing a mobile learning pedagogy for university environments such as key stakeholders in a potential mobile learning environment, characteristics related to embedding interactivity into the mobile teaching and learning, and characteristics which are apparently techno-centric yet play a key role in the design of mobile learning environments.

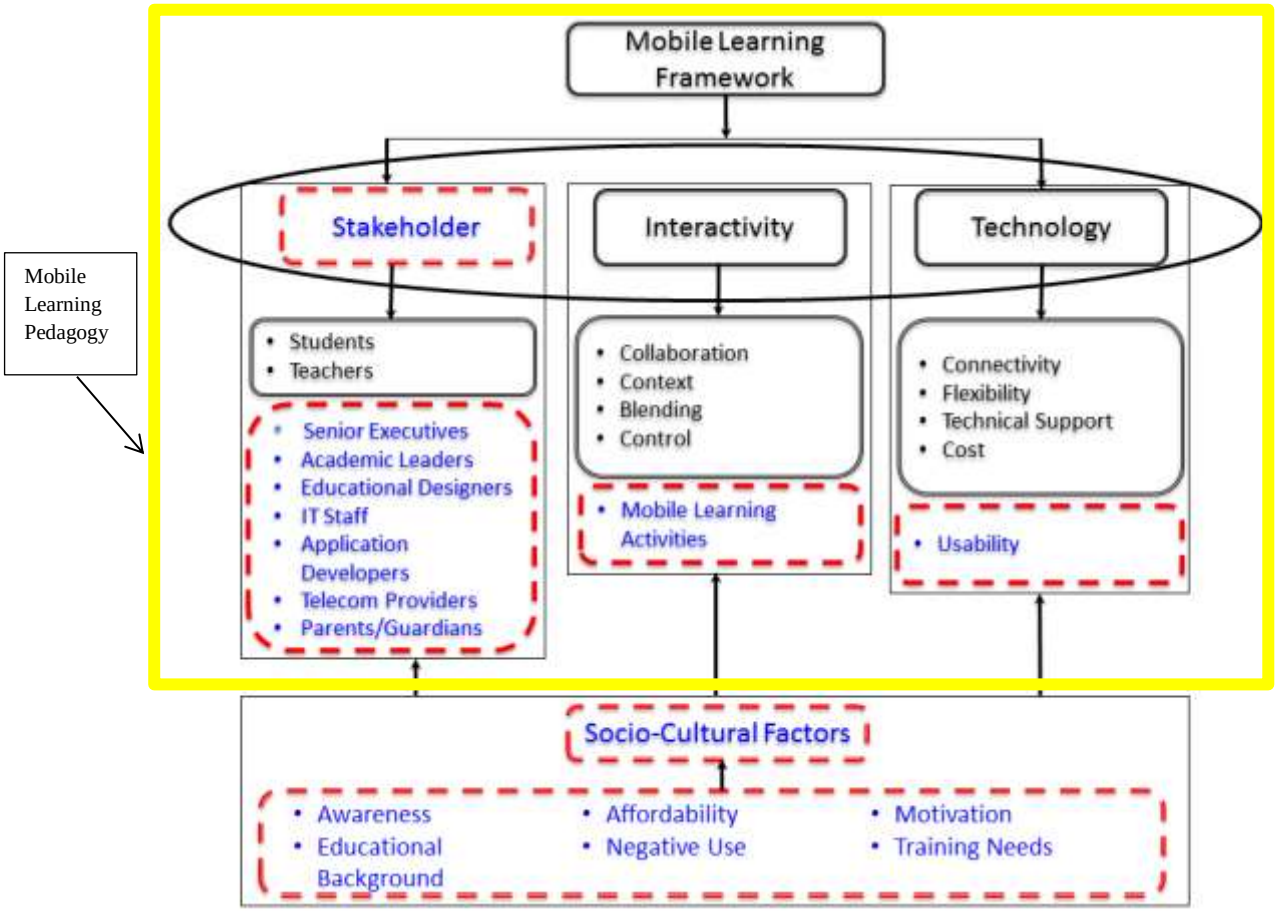


Figure 42: Components of Mobile Learning Framework for Universities in Pakistan Contributing towards Mobile Pedagogy

The notion of mobile pedagogy was used by UNESCO (UNESCO 2013a, 2) as one of the themes for the research discussions, symposiums and workshops to focus on during Mobile Learning Week 2014. The following guiding questions were posed by UNESCO for researchers and practitioners in the mobile learning field to ponder upon the theme of mobile pedagogy:

> *'MOBILE PEDAGOGY: How is mobile learning changing the role of teachers? How do mobile technologies improve pedagogy and strengthen education quality? How should mobile technologies be integrated into formal and informal learning environments?'*

In mobile learning research and practice avenues, the term 'mobile pedagogy' is new and becoming popular. McConatha et al. (2013, 1) in their new book on mobile

learning titled *Mobile Pedagogy and Perspectives on Teaching and Learning*, exclusively deal with the topic of mobile pedagogy and define it as:

> *'Mobile Pedagogy: comprises the tools and techniques designed to leverage today's wireless applications and socially connected networks to improve learning outcomes, develop means and methods to advance teaching and provide creative ways to increase access to educational resources for all.'*

Although, the term is new in mobile learning arenas as it was first coined in 2002 (McManus 2002) the evolution of mobile pedagogy began with the advent of the printed book in the distant past as mentioned by Laurillard (2007) and arguments of activity theory where the learner is supposed to learn independently of a particular space and time (Uden 2007; Vygotsky 1978). As one of the key contributions of this research, the set of common mobile learning characteristics and their relevant categorization in new mobile learning framework for universities in Pakistan have informed the design of a mobile learning environment and a mobile learning pedagogy for universities. Hamm et al. (2014) argue that traditional learning pedagogies could be mapped for mobile learning in order to define a mobile pedagogy. For instance, collaboration, ongoing monitoring of students' progress and learning, remote teaching and provision of formative feedback on students' assessments are available and currently in use as pedagogies in traditional learning environments which would be easily mapped with mobile pedagogy (McConatha et al. 2014; UNESCO 2013a). The Mobile Learning Framework for Universities in Pakistan contains all of these characteristics leading to a mobile learning pedagogy; unlike the term *mobile pedagogy* used in mobile learning literature, the term *mobile learning pedagogy* has been coined as an outcome of this research.

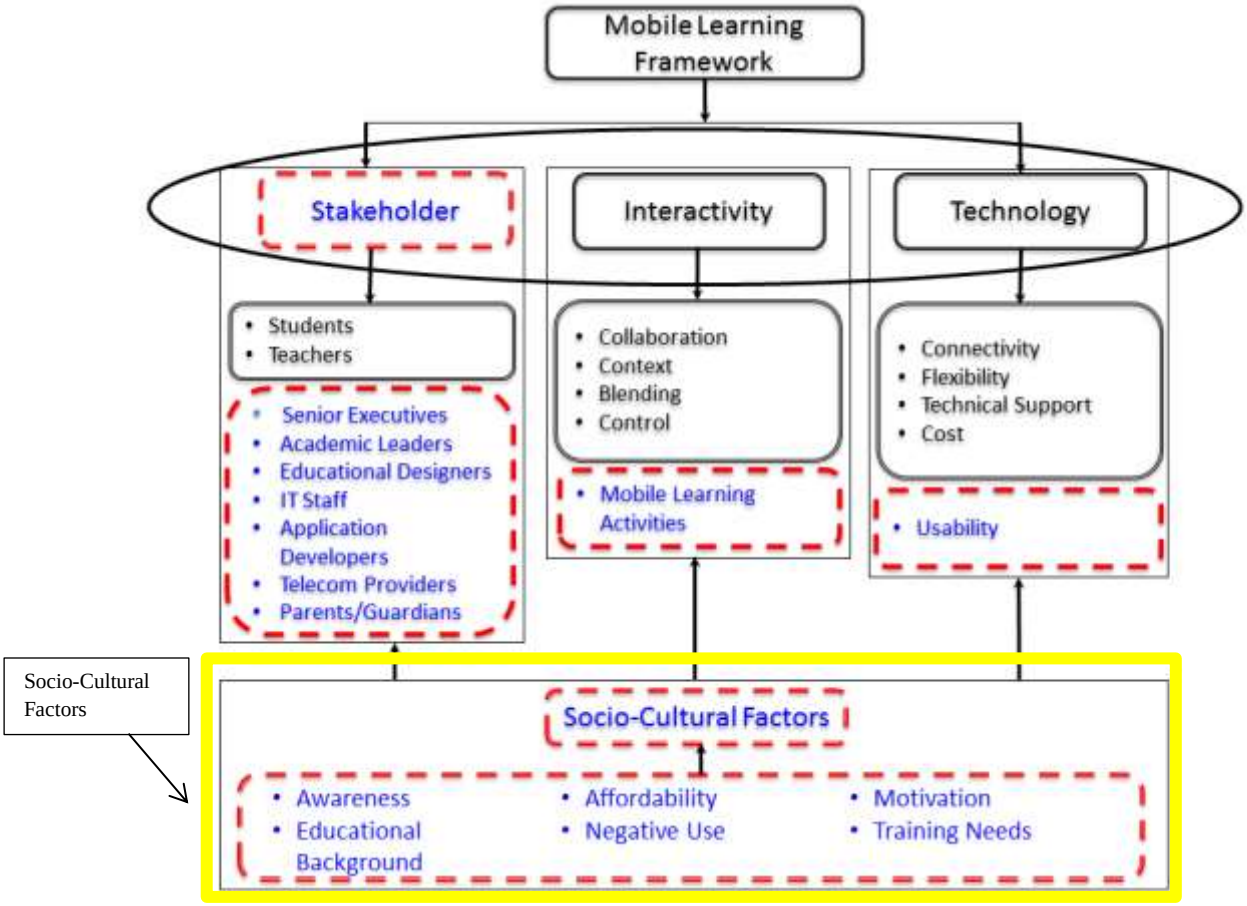


Figure 43: Socio-Cultural Factors of Mobile Learning Success in Pakistan

The lower part of the framework (see Figure 43) represents the social and economic factors from Pakistan as a developing country. These factors might impact on the success or otherwise of mobile learning implementation in Pakistani universities in future. This part of the framework could be viewed and used separately as socio-cultural factors of mobile learning in a developing country or Pakistan in this case. However, by incorporating this section (see Figure 43) into the other components of the framework (Figure 40), the whole framework represents the outcomes of this research which tells the story of mobile learning in Pakistani universities. This mobile learning framework as shown in Figure 40 could be generalized for other developing countries having similar societal and cultural norms. Researchers from other developing countries such as Alzaza and Yaakub (2011) and Kumar et al. (2010) point out that there is dire need to raise awareness of potential benefits of mobile learning in Malaysia and India. Similarly, Oliver and Georke (2008) found that motivation was one of the driving factors for the Euthopian students to get invovled in mobile learning. Kim et al. (2009)'s study highlights the affordability issues for Latin American children to engage into mobile learning. Thus, the

component called socio-cultural factors in this framework could be generalized to many other developing countries such as India, Bangladesh, Indonesia, Malaysia, Latin America, Euthopia, South Africa and Keyna.

7.4 Answering the Research Questions

Based on the results, discussion and findings presented in Chapters 4, 5 and 6, and the arguments presented in earlier sections of this chapter for Mobile Learning Framework for Universities in Pakistan (Figure 40), the answers for the research questions will be addressed in this section. Four research questions were framed at the outset of the study to be answered by this research. These research questions are as follows:

1. What do the students perceive and expect of mobile learning in Pakistani universities?

2. What do the teachers perceive and expect of mobile learning in Pakistani universities?

3. What do the administrative stakeholders perceive and expect of mobile learning in Pakistani universities?

4. What are the common mobile learning characteristics to consider when designing a mobile learning environment for Pakistani universities?

With reference to the first three research questions of the study, the findings from a comparative data analysis of students' and teachers' focus groups and stakeholders' interviews show that the perceptions and expectations of the participants in all of the three groups were similar for a number of pedagogical and technological mobile learning characteristics and associated challenges. For example, the majority of participants agreed that mobile devices added flexibility to teaching and learning. Similarly, all participant groups believed that the introduction of mobile learning to create a blended learning environment would be the most viable solution for Pakistani university environments. In reference to IT infrastructure, several participants including teachers, IT managers and senior executives believed that

universities' current IT infrastucture might need to be upgraded and tested for mobile learning prior to any formal implementation. The mobile learning characteristics about which the majority of participants had similar opinions mainly include collaboration, context, mobile learning activities, teacher's role and costs associated with mobile learning.

With reference to the newly emerged socio-cultural factors associated with any mobile learning implementation in Pakistan, almost all of the participants from focus groups and interviews mentioned the same issues such as the need for creating awareness of mobile learning among all of the relevant stakeholders, setting certain norms and policies for mobile learning engagement, handling possible inappropriate use of mobile learning resources, and harnessing the motivation of students and teachers for mobile learning engagement. Participants from all of the groups strongly believed that these socio-cultural factors would affect any mobile learning implementation in Pakistani university environments.

However, there were differences in perceptions and expectations of certain mobile learning characteristics. For instance, students reported a number of issues related to the usability of mobile devices for learning whereas teachers, instructional designers and IT managers pointed out that many of these reported usability issues were wrongly perceived by students due to lack of user experience by those students who did not already own a smart phone. In addition, many students tried to attempt certain learning tasks using mobile devices which were not meant to be conducted on a mobile device such as programming assignments, attaching big data files to emails and submission of assignments.

Another example of the differences of perceptions and expectations among the different groups of participants is the issue of workload management for teachers if mobile learning were introduced. Teachers perceived that they would be burdened with extra work if they became involved in formal mobile teaching and learning activities, whereas senior administrative stakeholders perceived that teachers' workloads would decrease by reducing face-to-face contact hours; instead, they would be able to provide feedback and advice to students via mobile devices. The workload issue warrants further investigation and extensive work. This is where both research into mobile learning and the actual practice of mobile learning could

inform university academics and administrators. Mobile learning characteristics where participants from different groups had different perceptions, experiences and expectations include usability, user experience, connectivity and need for technical support.

With reference to answering the fourth and final research question of the study, the common mobile learning characteristics include collaboration, context, flexibility, control, blending, mobile learning activities, connectivity, technical support, cost, usability, user experience, awareness, motivation, learners' socio-economic and educational background and possible risk of misuse of mobile learning resources. However, the answer to the final research question required more than just a list of the characteristics mentioned above, particularly since these mobile learning characteristics as outcomes of this study would be taken into consideration when designing a mobile learning environment for Pakistani universities in future. Therefore, in the light of findings of the research, a mobile learning framework for Pakistani universities has been developed (for details and relevant discussion, refer to the Section 7.3.5 and Figure 40). This framework answers the final research question by integrating the main categories of stakeholders, interactivity and technology with each other and grouping relevant mobile learning characteristics under each of these categories together with certain socio-cultural factors to be considered when designing mobile learning environment for Pakistani universities. To be more clear and precise in answering the research questions, the new Mobile Learning Framework for Universities in Pakistan could be used as a blueprint as well as an action plan for designing mobile learning environments in Pakistani universities and framing a mobile pedagogy.

7.5 Chapter Summary

This chapter concludes the outcomes of this research into a new Mobile Learning Framework for Universities in Pakistan. The initial mobile learning conceptual model was presented in the opening sections of the chapter to remind the reader of the conceptualization that emerged from the literature and to inform the research design for this study. A detailed discussion was presented to compare each component of the old model with the new framework in separate sections. The

findings confirming those in the literature and the new findings have been clearly stated in figures and in text to indicate the contributions of this research to the body of knowledge in the field of mobile learning.

Different possibilities of generalization of each component of the new Mobile Learning Framework have been discussed for the developed and developing countries. A detailed comparison for the applicability of characteristics included in Mobile Learning Framework has been added in Appendix J as Table 11. Based on the findings and outcomes of this research, answers to the research questions have been presented in the concluding sections of the chapter.

CHAPTER 8
CONCLUSIONS

8.1 Introduction

This chapter concludes the findings of this research. The major contributions made by this research to theory and practice are presented in the following sections. The development of a mobile learning framework has contributed to the theory component of mobile learning. As discussed in Chapter 7, MLF has been developed from the data collected from Pakistani universities, yet provides a blueprint for the planning and implementation of mobile learning intiatives in university environements in other developed and developing countries. Recommendations for the practice have been made for a number of stakeholders potentially involved in a mobile learning environment if implemented in future in Pakistani university environments as well as for other developing and developed countries. Limitations of this study have been acknowledged in Section 8.3 and proposals for future research are presented in Section 8.4. Subsequently, there is a chapter summary and a list of the references used within the whole thesis. Finally, several appendices have been added for the reader's reference.

8.2 Research Contributions

This research makes a number of contributions to the field of mobile learning as presented in detail in the previous chapters as outcomes of the analysis of data gleaned from the students' focus groups, teachers' focus groups and interviews with administrative stakeholders from Pakistani universities. In the previous chapter (Chapter 7), the mobile learning framework for Pakistani university environments was presented in reference to the findings presented in the Chapter 4, Chapter 5 and Chapter 6. This section will not only confirm some of the major contributions made by this research to mobile learning literature, theory development, mobile learning

researchers as well as practitioners, but will also articulate those contributions with reference to the mobile learning in Pakistan in particular and in developing countries in general. In addition, it is important to note that this study has been mainly focused on Pakistani university environments and other similar developing countries; however, some of the findings are generalizable for developed countries as well. Some examples were mentioned in Chapter 7; similarly, several pointers for widely generalizable findings and recommendations have been discussed in the following concluding sections.

From the data analysis assisted by Nvivo and the interpretations of participants' statements, four main areas have emerged as outcomes of this study where mobile learning characteristics have been investigated for Pakistani university environments and major contributions of this research have been concluded. These areas include: 1) identification of key stakeholders who will directly or indirectly involved in mobile learning environment, 2) pedagogical benefits of mobile learning, 3) technological aspect of mobile learning, and 4) socio-cultural factors which may greatly influence the success of mobile learning implementation in Pakistani university environments. The following subsections highlight the major findings and contributions of this research to each of these areas.

8.2.1 Key Stakeholders in a Mobile Learning Environment

In a developing country environment such as Pakistan, the involvement of certain stakeholders in a mobile learning implementation is imperative. For example, in the research design, a number of key stakeholders were included as participants for data collection including students, teachers, IT managers, instructional designers and senior administrative personnel; however, the outcomes of the data analysis as presented in Chapter 6 indicate that a few more groups of stakeholders should be included in the future implementation of mobile learning in Pakistani university environments.

These newly added groups of stakeholders include parents and guardians of the students who are usually responsible for students' education expenditure in Pakistani social environment; therefore, they need to be aware of students' involvement in mobile learning. The findings revealed that mobile learning educational designers

and content developers are required to assist with designing and developing certain mobile learning activities and software applications as well as optimization of learning content to be accurately displayed on mobile devices. It is recommended that Universities in Pakistan consider involving telecommunication providers in the mobile learning implementation process to negotiate mobile internet data plans for staff and students.

The identification of key stakeholders for a particular educational environment such as universities in Pakistan is crucial to the success of any future implementation of mobile learning in Pakistani university environments. This research has made this important contribution to the mobile learning literature; moreover, future mobile learning researchers could use MLF (refer to Figure 40 in Chapter 7) to implement mobile learning in Pakistan and other countries with university environments similar to those of Pakistan. Involving parents or guardians might also work for some neighbouring countries near the Indian sub-continent whose socio-economic and socio-cultural are the same as Pakistan's. The involvement of university senior executives, academic leaders and IT staff in mobile learning initiatives would be required in university environments in almost any place in the world, thereby making it generalizable to the wider population. Negotiating with telecommunication providers may vary with different countries with reference to the strength and monopoly of certain telecommunication companies or providers. For instance, in Pakistan, it is possible for universities to negotiate cheaper rates for telecommunication services for students and staff but it may not work in some other countries.

Another contribution made by this research is that the list of stakeholders identified by this research would also be useful for other mobile learning researchers around the world who want to identify and recruit potential research participants for the data collection for future mobile learning studies in university environments for developed or developing countries.

8.2.2 Mobile Learning Pedagogy

The outcomes of the data analysis in this research show that certain mobile learning characteristics create pedagogical benefits for the teaching and learning

environments of universities. These characteristics are based on the learner's interactivity with the teacher, the learning resources and learning environment irrespective of the learner's location, physical presence and timing; outcomes of this research show that these characteristics mainly include collaboration, context, blended learning, control and mobile learning activities or content. For instance, in Pakistani universities, students and teachers have been using mobile devices to collaborate with each other for projects and assignments across multiple contexts on campus as well as during fieldwork, internships and data collection activities. Similarly, students and teachers have been involved in several mobile learning activities informally by blending these mobile learning activities with existing mobile learning activities which proved to enhance students' motivation to engage into learning activities. These pedagogical benefits make mobile learning distinct from other forms of learning as it conforms to the nature of the human learning process which is a continuous process irrespective of time and location (Engeström 1987). These characteristics of mobile learning lead to the notion of a distinct mobile learning pedagogy which includes a unique blend of technology, and supports the strong learning theories such as constructivist, behaviourist and conversational learning theories as well as activity theory (Anderson 2008; Beetham and Sharpe 2013; Hamm, Drysdale, and Moore 2014; Laurillard 2007; McConatha et al. 2014; Naismith et al. 2004a; Ozdamli 2012; Sharples, Taylor, and Vavoula 2010; Traxler 2011; Uden 2007; UNESCO 2013a; Vygotsky 1978). In the mobile learning intiatives and projects around the world, UNESCO has been actively engaging researchers and practitioners from all over the world in pursuit of the development of mobile learning policy guidelines and strategies. During Mobile Learning Week 2014, UNESCO called for contributions to develop a mobile pedagogy (Steve 2012; UNESCO 2013b, 2013a). The contribution to mobile learning pedagogy made by the findings of this research may add to the mobile pedagogy development initiated by UNESCO. The list of mobile learning characteristics leading to the establishment of a mobile learning pedagogy for university environments is a key contribution of this research to the mobile learning literature and theory development. Future researchers could build upon the contribution of this study and work towards the detailed design and evaluation of mobile learning pedagogy for university environments and other educational settings across the world.

8.2.3 Harnessing the Power of Technology

As discussed in section 8.2.2, the availability of mobile technology is crucial to the establishment of a mobile learning pedagogy. In particular, harnessing the power of mobile technologies for education would be of great advantage to the developing countries such as Pakistan. The adoption of mobile technologies in Pakistan and other developing countries has greatly accelerated over the last two decades (WorldBank 2009). The outcomes of this research show that there are several technological characteristics of mobile learning that need to be considered if the power of technology is to be harnessed for university learning environments in Pakistan as well as working towards the mobile learning pedagogy. As discussed in detail in Chapter 7, these technological characteristics include flexibility, connectivity, technical support, cost and usability. The data collected from a number of stakeholders from Pakistani universities reveal that the existing informal use of mobile devices for learning by students and teachers has added flexibility to their teaching and learning. However, data from this research also reveal that some of the characteristics related to the technological aspect would need to be carefully evaluated before any implementation of mobile learning in Pakistani university environments.

Participants from Pakistani universities shared their experiences, perceptions and expectations of certain technology-related characteristics such as mobile internet connectivity, availability and need for technical support, cost of mobile devices and mobile internet and usability of mobile devices for learning (refer Chapter 4, 5 and 6 for details). Mobile learning literature shows that students' experiences with technology, their views regarding the features of mobile devices, and their concerns about usability and cost differ widely in many countries (Alzaza and Yaakub 2011; Economides and Grousopoulou 2009, 2010; Gururajan et al. 2011; Oliver and Goerke 2008; Song 2011). Therefore, the findings of this research and MLF can be generalized to the developed countries as well. By using the Mobile Learning Framework from this research as a baseline, researchers in other countries might need to collect data separately from other countries to conceptualize and theorize the technology aspect of mobile learning for their own countries.

8.2.4 Socio-Cultural Factors Impacting on Mobile Learning Implementation in Pakistan

As detailed in Chapters 4, 5 and 6; several socio-cultural factors emerged from the analysis of data about the perceptions and expectations of the research participants. According to the participants, these socio-cultural factors might greatly impact on the future of mobile learning in Pakistan. These socio-cultural factors include awareness, motivation, training, diversity in educational backgrounds, affordability and negative usage. Participants stressed the need to raise the awareness of mobile learning among teaching and learning communities. Similarly, utilizing the motivation of students and teachers for mobile learning by providing them with appropriate training and support would be of great advantage for teaching and learning environments in Pakistani universities. Customized training and financial support would also be required for people from diverse educational and socio-economic backgrounds in order to create uniformity in the audience and among users of mobile learning. Finally, in order to ensure mobile learning implementation a success in Pakistani university environments, it is essential to establish certain rules and regulations to avoid the possible negative exploitation (such as missing face-to-face lectures and engaging in non-constructive activities on mobile devices) of mobile learning opportunities by all of the stakeholders in university environments in Pakistan.

Socio-cultural factors, including the risks and challenges mentioned by the participants in this research, would also be applicable to other developing countries since similar challenges related to social and cultural norms and economic limitations of developing countries' environments have been pointed by Mohammad (2012) and Sife et al. (2007) for Malaysia and Tanzania. In addition, some researchers from other developing countries have mentioned other issues such as motivation as discussed by Barker et al. (2005), and Kumar et al. (2010) mentioned the socio-economic plight of children in India. However, none of these literature studies have concluded that a consideration of these socio-cultural factors are crucial for the success of mobile learning implementation. The findings of this research regarding socio-cultural factors may be generalized for other developing countries having similar social, cultural and economic trends as those of Pakistan.

Although, socio-cultural factors have been determined for a developing country as outcomes of this research, developed countries might also utilize the socio-cultural component of the MLF (see Figure 40 in Chapter 7) partially as some of the socio-cultural factors and challenges might apply to the university environments in developed countries as well. For instance, most of the developed countries host multicultural populations due to the majority of the immigrants from Asian and African developing countries who may have similar needs in terms of awareness, training and might have different educational and economic background as compared to the nationals of the developed countries. In particular, universities in developed countries might be able to redevelop their mobile learning strategies and implementation policies to acknowledge the cohorts of students from international community who have different social, cultural and economic values from those of nationals of developed countries. Interestingly, there is little in the mobile learning literature that considers this important matter in terms of mobile learning implementations, pilots and trials in being undertaken for all educational levels in developed countries. Some of the challenges such as the negative use of mobile learning resources might not apply to the university environments in developed countries because the majority of the educational institutions and universities in these countries have established a code of conduct to ensure the ethical utilization of the university's learning resources already available. However, it might still be relevant for developed countries to be cautioned about these negative uses by student cohorts from diverse backgrounds.

To conclude, the Mobile Learning Framework presented in Chapter 7 has been formulated as the outcome of this research for university environments in Pakistan yet it has scope to be generalized to other developing countries particularly neighbouring countries to Pakistan. Mobile learning researchers and practitioners from developed countries might also be able to build upon some of the findings of this research catering to the needs of particular university environments and multi-cultural cohorts within student and staff populations.

8.3 Recommendations

This research has focused mainly on identifying mobile learning characteristics for Pakistani university environments; therefore, by concluding the results, discussion and findings of this research, there are a number of recommendations to be made to several stakeholders in Pakistani university environments. The following recommendations would also serve to demonstrate the practical implications of this research for several potential stakeholders. These stakeholders could include people who are directly and indirectly concerned and involved in planning for mobile learning project for trials, mobile learning future research, design and redesign of mobile learning content and activities, cost and resources required for mobile learning implementation, operations and its success in Pakistani university environments. Further, these recommendations could also be utilized by universities and stakholders in other developing or developed countries planning to implement mobile learning intiatives in their organizations.

Students would benefit the most from any future mobile learning implementation in Pakistani university environments. Students would be able to use mobile devices to learn independently of time and location by engaging in learning activities anywhere and at any time and collaborating with teachers and peers. Engaging in mobile learning would provide them with the opportunity to use educational ICTs at an international standard. It would also broaden their views and they could consider exchange opportunities in other countries, be these developing or developed countries.

Teachers would be able to add flexibility to their existing teaching and learning process, optimize their time for student consultation, manage their teaching workload, and collaborate with students by providing support for their learning process. Teachers would be able to avail themselves of training opportunities in order to use the latest ICTs in their teaching and learning. Further, teachers could experiment with mobile learning in several innovative ways appropriate for their particular courses.

By introducing and implementing mobile learning, universities might be able to incorporate their ICT strategies and upgrade their educational ICTs to meet international standards of providing modern technological resources and facilities to staff and students. In addition, universities might save the costs of maintaining computer labs and associated hardware as the use of mobile devices for learning might reduce the students' use of computer labs on campus. University executives could use mobile learning implementation as a marketing edge within the Pakistani higher education market to enhance their reputation and boost student enrolments.

Academic leaders and educational designers would be able to consider the findings of this research when designing mobile learning activities within Pakistani universities. They could use the Mobile Learning Framework for Pakistani universities to embed interactivity into the mobile learning content design while keeping the technology-related characteristics in focus; they could work towards their own mobile learning pedagogy. Socio-cultural factors might also provide insights for mobile learning content design for different cohorts of students within the universities.

New jobs will be created for the mobile learning content developers who will be responsible for developing mobile learning applications and activities in collaboration with educational designers. Alternatively, universities might outsource mobile learning content development to the ICT contractors, educational content development companies and publishing companies. However, the role of mobile learning content developers and educational designers is crucial not only in developing mobile learning content, but also in providing support and maintenance to the teaching staff once mobile learning has been blended into the university' existing learning streams.

IT managers may need to recruit or appoint separate staff members to deal with the enquiries from mobile learning users including teachers and students. IT managers would also need to manage necessary upgrades to existing ICT infrastructure to cater for the mobile learning implementation and operational requirements. Telecommunication providers would be interested to market particular mobile internet data plans and packages for students and teachers from the targeted higher

education mobile learning market. Universities might be able to negotiate with telecommunication providers for discounted rates for staff and students.

Parents of the students may be able to engage in mobile learning indirectly to check information such as their children's study progress, enrolment status, grades, exam results, fee status and attendance status. Similar practice has been reported by one of the administrators in University C where parents have been given access to their children's records by allocating them separate login names and passwords for the university's Learning Management System. However, issues could arise about the privacy of the university-owned data that could be leaked publically, causing universities serious trouble. Universities could set up policies and allow stakeholders outside the university, such as parents, a restricted access to university data and information systems.

A key recommendation emerging from this research is that universities develop and enforce a code of conduct for the ethical use of mobile learning resources for staff and students. According to the participants in this research, this is a strong concern and if addressed successfully, this will enhance chances of success for mobile learning implementation in Pakistani universities. In addition, universities might need to change some of the existing policies such as the mandatory attendance policy which may conflict with or compromise the benefits of mobile learning such as enhanced flexibility for staff and students. Change in university policies is a critical and complicated process which involves bureaucracy at many managerial levels within the organizational structure. Similarly, the development and enforcement of a code of conduct for the ethical use of university resources and flexibility provided by mobile learning by staff and students would be a difficult step for senior executives. However, these procedural upgrades are key ingredients for the success of mobile learning in Pakistani universities.

Another recommendation for the universities in Pakistan planning to introduce or test mobile learning would be to establish a BYOD policy. Establishing BYOD policy would encourage students to experiment with mobile leanring activities informally using their own devices. As discussed in the discussion and findings chapters (4, 5 and 6) about students' expectations from university to assist with purchase of mobile devices for learning, the senior executives of universities could achieve this goal by

establishing the BYOD policy for staff and students. This would result in saving costs to university as well as lesser problems of privacy of users' personal data if they would use university-owned devices.

8.4 Limitations of the Study

There are a number of contributions made by this study to the literature and implications for practice as detailed earlier sections of this chapter; however, the study also has several limitations as discussed in the following paragraphs.

This study has focused on the higher education sector, in particular, universities in Pakistan. Mobile learning characteristics and challenges might be very different in other teaching and learning environments in Pakistan such as elementary and secondary schools, professional training programs and workplace learning environments.

This study did not focus on particular mobile devices such as tablets or smart phones and or particular brands such as Apple, Samsung or Microsoft; nor did it focus on a certain platform such as iOS, Windows or Android devices. Mobile learning characteristics were investigated irrespective of the users' possession and use of a particular device. However, during the site visits in data collection and focus groups sessions, it was observed that participants had devices representing a variety of makes, models, brands and platforms. It is important to mention that the benefits of mobile learning may not be harnessed if a particular device is used or specified unless it is done for a controlled research experiment or the education provider is generous enough to provide identical devices to all staff and students. Ideally, mobile learning would be blended into the existing forms of learning within universities as seamless integration and users of almost all types of smart mobile devices would be able to access learning resources and engage in mobile learning activities.

Another important limitation of this study is the small sample size of the population for data collection which might make it difficult to generalize the findings of this study to a wider population. Three mainstream Pakistani universities were included

for participation in this research where 6 focus groups were conducted with staff and students and 9 interviews were conducted to the administrative stakeholders. However, this limitation might not affect or compromise the findings of this study for generalization since university policies, funding and structure is governed by Higher Education Commission in Pakistan which is a federal government agency for maintaining certain standards and quality of higher education and funding allocation. Therefore, all of the mainstream universities have similar policies and standards in all states and provinces of Pakistan which makes it rational to generalize the findings of this research to almost all mainstream private and public sector universities in Pakistan.

The universities included in this research are located in the metropolitan area of the large city of Lahore in the biggest province of Pakistan; other small cities and regional universities have not been included as cases in this study. Although, the student cohorts in these three mainstream universities represent all regions, rural and under-developed areas, it is to be acknowledged that the feasibility of exploring mobile learning for other regions might reveal many more challenges as well as potentials for the populations living in those areas.

Due to the constraints of time and resources for a PhD study, only certain types of stakeholders participated in data collection; these were students, teachers, IT managers, academic leaders and university senior executives; therefore, there is a need to include the perspectives of telecommunication providers, mobile learning content designers and developers and other members of the community such as parents or guardians of students.

This study used qualitative data derived from focus groups and interviews due to the nature of research problem. A quantitative survey study may be replicated in future to include the participants from more universities.

This study focuses on the conceptualization of mobile learning for Pakistani universities with no implementation trials associated with it. A future study might build upon the findings of this research to acquire funding from national or international agencies such as Higher Education Commission in Pakistan or

UNESCO as international agency for a trial implementation of mobile learning project in one of the participant universities.

8.5 Future Research Directions

The outcomes of this research reveal several possibilities for future research into mobile learning in Pakistan at different education levels and in different settings. Many of these future research directions could also be considered by mobile learning researchers in other developing or developed countries. A number of possible proposals for future research are as follows:

- A trial implementation of mobile learning should be conducted in one of the universities based on the findings of this research. A trial or pilot implementation would not only persuade the administrative stakeholders about the benefits and potential of mobile learning for universities, but would also reveal real-time challenges associated with the implementation of mobile learning in Pakistani university environments.

- In case of limited funding and resources for trial implementation, an offline mobile learning could be researched for university students. In an offline mobile learning environment, students would be able to download or store learning resources on their mobile devices either by connecting to a computer or subject to the availability of freely available Wi-Fi on campus. They would be able to review these learning resources in their own time whenever they wanted. However, students would have limited mobile learning activities in off-line mobile learning but it would be good to start with mobile learning in university environments.

- Building upon the outcomes of this research about mobile learning pedagogy, future researchers could pursue the detailed design and evaluation of mobile learning pedagogy for university environments.

- Distance education provider universitities and professional institutes might be more interested in embracing mobile learning practices compared to traditional

education providers. Future research is needed in order to explore the feasibility of introducing mobile learning to distance education in Pakistan.

- Another mobile learning future research proposal with huge potential is to offer offline mobile learning to the underprivileged populations in rural areas of Pakistan to provide them with the basic education facilities using low-cost mobile devices. This future research proposal might need enormous funding and the involvement of many government and non-government agencies as well strong community support.

- One of the key future research proposals is to use mobile learning in order to improve and promote female literacy rates in Pakistan's rural areas. In some rural areas, parents do not choose to send their daughters to school for security reasons; these girls could benefit from mobile learning opportunities in oder to become literate.

- A code of conduct for mobile learning users could be developed for university environments. Data could be collected from teachers, students and university leadership groups in order to establish a code of conduct. Code of conduct may include but is not limited to fair use of network resources, ethical communication among staff and students, seeking permission before recording any face-to-face lecture or virtual communication, and respecting the privacy of teaching staff and fellow students. The establishment and enforcement of a code of conduct for mobile learning users would be one of the key factors in the success of mobile learning implementation in Pakistani university environments.

- Future research opportunities exist in the area of self-regulated learning for mobile learners. There is a dire need for the teaching staff and senior university leaders to perceive the importance of student-centred learning. In order to train, prepare and encourage students for self-regulated learning, staff should be convinced and trained to accept a less teacher-controlled learning environment.

- The use of mobile devices for social networking has become popular among university students in Pakistan and across the world. Universties and education providers could use these social networking forums as social learning spaces

instead of considering them as negative influences on students' academic performance. Furuther research is needed in this area to determine how universities could exploit the opportunity provided by these emergent social learning spaces to enhance student learning.

- Establishing and incorporating BYOD policies in university environments as precursor to mobile learning intiative is another future research opportunity. Currently, BYOD policies are being developed and tested in some of the universities in developed countries; thus making it an emerging future reserch are for mobile leanring in higher education environments around the world. BYOD policies for university environments in developing countries would also be worth researching by future researchers in order to assist universities in developing countries to switch to mobile learning with fewer complications.

- Future researchers might need to look into the opportunities mobile learning may provide for students and teachers in primary and secondary education. The study could also include a comparison between higher education and primary/secondary education.

- Another study is needed to investigate the comparison between using mobile technologies in teaching and learning Vs using non-mobile technologies to see the real difference and impact of mobile learning in teaching and learning environments.

8.6 Chapter Summary

This chapter concludes the thesis by providing a precise picture of the major contributions of this study to the literature and body of knowledge in the field of mobile learning with some pointers to mobile learning for developing countries in particular and for developed countries in general. Recommendations for a number of stakeholders in Pakistani university environments would provide them with guidelines to start introducing mobile learning into mainstream education within the universities in Pakistan. Limitations of the study have been acknowledged and could be addressed by future research in this area. Future research directions include a trial

implementation of mobile learning in Pakistani universities and provision of education to the underprivileged populations in rural areas of Pakistan.

REFERENCES

Adesope, O., S. Olubunmi, and J. McCracken. 2007. "Implementing Mobile Learning in Developing Countries: Prospects and Challenges" *World Conference on Educational Multimedia, Hypermedia and Telecommunications*,

Akhshabi, M., J. Khalatbari, and M. Akhshabi. 2011. "An Experiment on Conducting Mobile Learning Activities on the Virtual University." *Procedia - Social and Behavioral Sciences* 28 (0): 384-389.

Albrecht, U., M. Behrends, H. Matthies, and U. Jan. 2013. "Medical Students Experience the Mobile Augmented Reality Blended Learning Environment (Marble®): An Attractive Concept for the Net Generation?" In *Ubiquitous and Mobile Learning in the Digital Age*, eds Demetrios G. Sampson, Pedro Isaias, Dirk Ifenthaler and J. Michael Spector, 109-113. Springer New York.

Ali, S., Z. Haider, F. Munir, H. Khan, and A. Ahmed. 2013. "Factors Contributing to the Students Academic Performance: A Case Study of Islamia University Sub-Campus." *American Journal of Educational Research* 1 (8): 283-289.

Alistair, J. 2009. "Unitube Helps Students Flee Curriculum's Bonds." *Weekend Australian*

Ally, M. 2004. "Using Learning Theories to Design Instruction for Mobile Learning Devices" *Third International Conference on Mobile Learning 2004*,

———, ed. 2009. *Mobile Learning : Transforming the Delivery of Education and Training*: Edmonton, Canada : AU Press.

Alzaza, N. S., and A. R. Yaakub. 2011. "Students' Awareness and Requirements of Mobile Learning Services in the Higher Education Environment." *American Journal of Economics and Business Administration* 3 (1): 95-100.

Ambient-Insight's. 2008. *The Us Market for Mobile Learning Products and Services: 2008-2013 Forecast and Analysis*.

Anderson, T. 2008. *Theory and Practice of Online Learning Edited by Terry Anderson*. Edited by Terry Anderson. Edmonton: Edmonton : AU Press.

Attewell, J., G. Da Bormida, M. Sharples, and C. Savill-Smith. 2003. *Mlearn 2003 Learning with Mobile Devices*. London: Learning and Skills Development Agency.

Avison, D., and G. Fitzgerald. 1997. "Foreword." In *Information Systems: An Emerging Discipline?*, eds J. Mingers and F. Stowell. Berkshire England: McGraw-Hill.

Barak, M., J. Harward, and S. Lerman. 2007. "Studio-Based Learning Via Wireless Notebooks: A Case of a Java Programming Course." *International Journal of Mobile Learning and Organisation* 1 (1): 15-29.

Barbosa, J, R Hahn, D Barbosa, and C Geyer. 2007. "Mobile and Ubiquitous Computing in an Innovative Undergraduate Course" *38th ACM Technical Symposium on Computer Science Education (SIGCSE)* ACM Press

Barker, A., G. Krull, and B. Mallinson. 2005. "A Proposed Theoretical Model for M-Learning Adoption in Developing Countries" *MLearn*, 2005.

Basit, T. 2003. "Manual or Electronic? The Role of Coding in Qualitative Data Analysis." *Educational Research* 45 (2): 143-154.

Baskervillea, R., and J. Pries-Hejeb. 1999. "Grounded Action Research: A Method for Understanding It in Practice." *Accounting, Management and Information Technologies* 9: 1-23.

Becta. 2008. *Web 2.0 Technologies for Learning: The Current Landscape-Opportunities, Challenges and Tensions*.

Beetham, H., and R. Sharpe. 2013. *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning*: routledge.

Benbasat, I., D. K. Goldstein, and M. Mead. 1987. "The Case Research Strategy in Studies of Information Systems." *MIS Quarterly* 11 (3): 369-386.

Bogden, R. C., and S. K. Biklen. 1982. *Qualitative Research for Education: An Introduction to Theory and Methods*. Boston: Allyn and Bacon Inc.

Bormida, G. D., P. Lefrere, R. Vaccaro, and M. Sharples. 2002. "The Mobilearn Project: Exploring New Ways to Use Mobile Environments and Devices to Meet the Needs of Learners, Working by Themselves and with Others." edited by S. Anastopoulou, M. Sharples and G. N. Vavoula, Unsupported: Conference Proceeding Birmingham, UK: The University of Birmingham, UK.

Brown, I. 2009. "Art on the Move: Mobility - a Way of Life." In *New Technologies, New Pedagogies: Mobile Learning in Higher Education*, eds J. Herrington, A. Herrington, J. Mantei, I. Olney and B. Ferry. University of Wollongong.

Brown, J. S., A. Collins, and S. Duguid. 1989. "Situated Cognition and the Culture of Learning." *Educational Researcher* 18 (1): 32-42.

Brown, J. S., D. Metcalf, and R. Christian. 2008. Mobile Learning Update. Accessed Mar 23, 2010, www.masie.com.

Bruner, J. 1966. *Toward a Theory of Instruction.* Cambridge, MA: Harvard University Press.

Calbraith, D., and R. Dennick. 2011. "Producing Generic Principles and Pedagogies for Mobile Learning: A Rigorous Five Part Model." In *Models for Interdisciplinary Mobile Learning: Delivering Information to Students*, 26-48. IGI Global.

Cavaye, A. L. M. 1996. "Case Study Research: A Multi-Faceted Research Approach for Is." *Information Sytems Journal (Blackwell Science Ltd)* 6 (3): 227-242.

Caverly, D., A. Ward, and M. Caverly. 2009. "Techtalk: Mobile Learning and Access." *Journal of Developmental Education* 33 (1): 38.

Cavus, N. 2011. "Investigating Mobile Devices and Lms Integration in Higher Education: Student Perspectives." *Procedia Computer Science* 3 (0): 1469-1474.

Cavus, N., and D. Ibrahim. 2009. "M-Learning: An Experiment in Using Sms to Support Learning New English Language Words." *British Journal of Educational Technology* 40 (1): 78.

Chao, P., and G. Chen. 2009. "Augmenting Paper-Based Learning with Mobile Phones." *Interacting with Computers* 21 (3): 173-185.

Chao, R., S. Y. Huang, J. C. H. Chen, and J. Chang. 2009. "Development of Sts Collaborative Tutoring Strategy for U-Learning Environment." *International Journal of Mobile Learning and Organisation* 3 (4): 366-380.

Chatti, M. A., S. N. Srirama, I. Ivanova, and M. Jarke. 2010. "The Mobilehost Colearn System: Mobile Social Software for Collaborative Learning." *International Journal of Mobile Learning and Organisation* 4 (1): 15-38.

Chen, C. 2009. "Personalized E-Learning System with Self-Regulated Learning Assisted Mechanisms for Promoting Learning Performance." *Expert Systems with Applications* 36 (5): 8816-8829.

Chen, C., S. Chen, G. Hwang, and T. Yang. 2010. "Factors Influencing Teachers' Adoption of a Ubiquitous Technology Application in Supporting Teacher Performance." *International Journal of Mobile Learning and Organisation* 4 (1): 39-54.

Chen, T., P. Chiu, Y. Huang, and C. Chang. 2011. "A Study of Learners' Attitudes Using Tam in a Context-Aware Mobile Learning Environment." *International Journal of Mobile Learning and Organisation* 5 (2): 144-158.

Chen, W., and R. Hirschheim. 2004. "A Paradigmatic and Methodological Examination of Information Systems Research from 1991 to 2001." *Information Systems Journal* 14 (3): 197-235.

Chen, Y., T. Kao, J. Sheu, and C. Chiang. 2003. "A Mobile Learning System for Scaffolding Bird Watching Learning." *Journal of Computer Assisted Learning* 19 (3): 347-359.

Chen, Y. S., T. C. Kao, G. J. Yu, and J. P. Sheu. 2004. "A Mobile Butterfly-Watching Learning System for Supporting Independent Learning." edited by J. Roschelle, T. W. Chan, Kinshuk and S. J. H. Yang, Unsupported: Conference Proceeding JungLi, Taiwan: IEEE Computer Society.

Cheon, J., S. Lee, S. M. Crooks, and J. Song. 2012. "An Investigation of Mobile Learning Readiness in Higher Education Based on the Theory of Planned Behavior." *Computers & Education* 59 (3): 1054-1064.

Churchill, D., and J. Hedberg. 2008. "Learning Object Design Considerations for Small-Screen Handheld Devices." *Computers & Education* 50 (3): 881-893.

Clough, G., A. C. Jones, P. Mcandrew, and E. Scanlon. 2009. "Informal Learning Evidence in Online Communities of Mobile Device Enthusiasts." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 99-112. AU PRESS Canada.

Cobcroft, R., and A. Bruns. 2006. "Mobile Learning in Review: Opportunities and Challenges for Learners, Teachers, and Institutions." *Paper presented at Learning on the Move, Brisbane, Australia*.

Cobcroft, R. S. 2006. "Literature Review into Mobile Learning in the University Context."

Cope, M. 2005. "Coding Qualitative Data." *Qualitative research methods in human geography* 2: 223-233.

Copley, J. 2007. "Audio and Video Podcasts of Lectures for Campus-Based Students: Production and Evaluation of Student Use." *Innovations in Education and Teaching International* 44 (4): 387.

Cortez, C., M. Nussbaum, X. López, P. Rodríguez, R. Santelices, R. Rosas, and V. Marianov. 2005. "Teachers' Support with Ad-Hoc Collaborative Networks." *Journal of Computer Assisted Learning* 21 (3): 171-180.

Cristol, D., and B. Gimbert. 2013. "Academic Achievement in Byod Classrooms." *QScience Proceedings* (12th World Conference on Mobile and Contextual Learning [mLearn 2013).

Czerniewicz, L., and C. Brown. 2009. "A Study of the Relationship between Institutional Policy, Organisational Culture and E-Learning Use in Four South African Universities." *Computers & Education* 53 (1): 121-131.

Danaher, P. A., R. Gururajan, and A. H. Baig. 2009. "Transforming the Practice of Mobile Learning: Promoting Pedagogical Innovation through Educational Principles and Strategies That Work." In *Innovative Mobile Learning: Techniques and Technologies*, eds David Parsons and Hokyoung Ryu, 21-46. Hershey PA: IGI Global.

Daniel, S. K. 2006. "Usability Guidelines for Designing Mobile Learning Portals." In *Proceedings of the 3rd international conference on Mobile technology, applications \& systems, Bangkok, Thailand*. ACM.

Deng, Y. C., M. Z. Do, L. J. Chang, and Chan. 2005. "Puzzleview Activities: Encouraging Participation in Mobile Computer Support Collaborative Learning." Unsupported: Conference Proceeding Taiwan.

Denk, M., M. Weber, and R. Belfin. 2007. "Mobile Learning – Challenges and Potentials." *International Journal of Mobile Learning and Organisation* 1 (2): 122-139.

Divitini, M., O. K. Haugalokken, and P. Norevik. 2002. "Improving Communication through Mobile Technologies: Which Possibilities?" edited by M. Milrad, U. Hoppe and Kinshuk, Unsupported: Conference Proceeding Vaxjo, Sweden: IEEE Computer Society Press.

Dubé, L. 2003. "Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations." *Management information systems quarterly* 27 (4): 597-636.

Dudley, T., and P. Nikita. 1999. "Focus Group Analysis: A Guide for Hiv Community Planning Group Members." edited by Texas Department of Health, Dallas: UT Southwestern Medical Center at Dallas.

Dyson, L. E., R. Raban, A. Litchfield, and E. Lawrence. 2009. "Addressing the Cost Barriers to Mobile Learning in Higher Education." *International Journal of Mobile Learning and Organization* 3 (4): 381-398.

Economides, A. A., and A. Grousopoulou. 2009. "Students' Thoughts About the Importance and Costs of Their Mobile Devices' Features and Services." *Telematics and Informatics* 26 (1): 57-84.

———. 2010. "Mobiles in Education: Students' Usage, Preferences and Desires." *International Journal of Mobile Learning and Organisation* 4 (3): 235-252.

Eisenhardt, K. M. 1989. " Building Theories from Case Study Research. ." *Academy of Management. The Academy of Management Review* 14 (4): 532.

El-Bishouty, M. M., H. Ogata, G. Ayala, and Y. Yano. 2010. "Context-Aware Support for Self-Directed Ubiquitous-Learning." *International Journal of Mobile Learning and Organisation* 4 (3): 317-331.

Engeström, Y. 1987. *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research*. Helsinki, Finland: Orienta-Konsultit, OY.

Eraut, M. 2000. *Non-Formal Learning, Implicit Learning and Tacit Knowledge in Professional Work. The Necessity of Informal Learning*: Bristol: The Policy Press.

Eschenbrenner, B., and F. F. Nah. 2007. "Mobile Technology in Education: Uses and Benefits." *International Journal of Mobile Learning and Organisation* 1 (2): 159-183.

Evans, C. 2008. "The Effectiveness of M-Learning in the Form of Podcast Revision Lectures in Higher Education." *Computers & Education* 50 (2): 491-498.

Facer, K., R. Joiner, D. Stanton, J. Reid, R. Hull, and D.S. Kirk. 2004. "Savannah: Mobile Gaming and Learning." *Journal of Computer Assisted Learning* 20: 399–409.

Fernandez, V., P. Simo, and J. M. Sallan. 2009. "Podcasting: A New Technological Tool to Facilitate Good Practice in Higher Education." *Computers & Education* 53 (2): 385-392.

Fetaji, B., M. Ebibi, and M. Fetaji. 2011. "Assessing Effectiveness in Mobile Learning by Devising Mluat (Mobile Learning Usability Attribute Testing) Methodology." *International Journal Of Computers and Communications* 5 (3): 178-187.

Filstad, C., and P. Gottschalk. 2010. "Knowing in Mobile Organisations &Ndash; Trust and Knowledge Sharing in Virtual Teams." *International Journal of Mobile Learning and Organisation* 4 (3): 269-280.

Ford, M., and T. Leinonen. 2009. "Mobiled-Mobile Tools and Services Platform for Formal and Informal Learning." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 195-214. AU PRESS Canada.

Fotouhi-Ghazvini, F., P. S. Excell, A. Moeini, and D. J. Robison. 2008. "A Psycho-Pedagogical Approach to M-Learning in a Developing-World Context." *International Journal of Mobile Learning and Organisation* 2 (1): 62-80.

Frohberg, D., C. Göth, and G. Schwabe. 2009. "Mobile Learning Projects; a Critical Analysis of the State of the Art." *Journal of Computer Assisted Learning* 25 (4): 307-331.

Fuchs, C. 2012. "Cross-Institutional Blended Learning in Teacher Education: A Case Study." In *Refining Current Practices in Mobile and Blended Learning: New Applications*, 188-208. IGI Global.

Galliers, R. D. 1991. "Choosing Approppriate Information Systems Research Approaches: A Revised Taxonomy." *Information Systems Research*: 327-345.

Garrett, B., and C. Jackson. 2006. "A Mobile Clinical E-Portfolio for Nursing and Medical Students, Using Wireless Personal Digital Assistants (Pdas)." *Nurse Education Today* 26 (8): 647-654.

Gary, B. 2007. "Out of the Cabbage Patch." *EDUCAUSE Review* 42 (3): 80.

Geddes, S. 2004. "Mobile Learning in the 21st Century: Benefit for Learners." *The knowledge tree*, 6.

Georgieva, E. S., A. S. Smrikarov, and T. S. Georgiev. 2011. "Evaluation of Mobile Learning System." *Procedia Computer Science* 3 (0): 632-637.

Goulding, C. 2005. "Grounded Theory, Ethnography and Phenomenology: A Comparative Analysis of Three Qualitative Strategies for Marketing Research." *European Journal of Marketing* 39 (3/4): 294-308.

Goyette, S. 2005. "Handhelds in K-12 Schools." *Media & Methods* 41 (5): 22.

Green, H., amp, and C. Hannon. 2007. "Education for a Digital Generation."

Greer, T. 2013. *The Worldwide Mobile Location-Based Learning Market: 2011-2016 Forecast and Analysis*.

Gregson, J., and D. Jordaan. 2009. "Exploring the Challenges and Opportunities of M-Learning within an International Distance Education Program." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 215-246. AU PRESS Canada.

Grosseck, G. 2009. "To Use or Not to Use Web 2.0 in Higher Education?" *Procedia - Social and Behavioral Sciences* 1 (1): 478-482.

Gulati, S. 2008. "Technology Enhanced Learning in Developing Nations: A Review." *International Review of Research in Open and Distance Learning* 9 (1).

Gurdial, S. R. K., and ML Jones. 2007. "Qualitative Data Analysis: Making New Discoveries and Aligning Old Strategies." *4th International Qualitative Research Convention 2007, Malaysia*,

Gururajan, R., A. Hafeez-Baig, P. A. Danaher, and L. De George-Walker. 2011. "Student Perceptions and Uses of Wireless Handheld Devices: Implications for Implementing Blended and Mobile Learning in an Australian University." In *Models for Interdisciplinary Mobile Learning: Delivering Information to Students*, 231-246. IGI Global.

Hafeez–Baig, A., R. Gururajan, P. A. Danaher, and L. De George-Walker. 2013. "Principles and Pressures in Managing Student Attitudes to Innovative Mobile Learning: A View from an Australian Distance–Education–Intensive University." *International Journal of Management in Education* 7 (1): 149-162.

Hamm, Scott E., J. Drysdale, and D. Moore. 2014. "Towards a Mobile Learning Pedagogy." In *Mobile Pedagogy and Perspectives on Teaching and Learning*, 1-19. IGI Global.

Hashemi, M., M. Azizinezhad, V. Najafi, and A. Nesari. 2011. "What Is Mobile Learning? Challenges and Capabilities." *Procedia - Social and Behavioral Sciences* 30 (0): 2477-2481.

Hashim, A., W. Wan Ahmad, and R. Ahmad. 2011. "Usability Study of Mobile Learning Course Content Application as a Revision Tool." In *Visual Informatics: Sustaining Research and Innovations*, eds H. Zaman, P. Robinson, M. Petrou, P. Olivier, T. Shih, S. Velastin and I. Nyström, 23-32. Springer Berlin Heidelberg.

HEC. 2009. "Higher Education Commission, Pakistan." edited by Department of Education.

Herrington, A., and J. Herrington. 2007. "Authentic Mobile Learning in Higher Education" *Australian Association for Research in Education 2007 Conference*,

Herrington, J., A. Herrington, J. Mantei, I. Olney, and B. Ferry. 2009. "Using Mobile Technologies to Develop New Ways of Teaching and Learning." In *New Technologies, New Pedagogies: Mobile Learning in Higher Education*, eds J. Herrington, A. Herrington, J. Mantei, I. Olney and B. Ferry. University of Wollongong.

Hirschheim, R. 1985. "Information Systems Epistemology: An Historical Perspective." In *Research Methods in Information Systems*, 13-35. North-Holland, Amsterdam.

Hooft, M. 2013. "The Potential of Mobile Technologies to Connect Teaching and Learning inside and Outside of the Classroom." In *Emerging Technologies for the Classroom*, eds C Mouza and N. Lavigne, 175-186. Springer New York.

Hug, T. 2012. "Mobile Learning as 'Microlearning': Conceptual Considerations Towards Enhancements of Didactic Thinking." In *Refining Current Practices in Mobile and Blended Learning: New Applications*, 41-52. IGI Global.

Hwang, G., and H. Chang. 2011. "A Formative Assessment-Based Mobile Learning Approach to Improving the Learning Attitudes and Achievements of Students." *Computers & Education* 56 (4): 1023-1031.

Hwang, W., J. Su, J. Hsu, and H. Huang. 2010. "A Study on Ubiquitous Computer Supported Collaborative Learning with Hybrid Mobile Discussion Forum." *International Journal of Mobile Learning and Organisation* 4 (1): 98-112.

Idrus, R. M., and I. Ismail. 2010. "Role of Institutions of Higher Learning Towards a Knowledge-Based Community Utilising Mobile Devices." *Procedia - Social and Behavioral Sciences* 2 (2): 2766-2770.

Imtinan, U. 2010. "Iidentifying Mobile Learning Characteristics for Universities in Pakistan." In *Curtin Business School Doctoral Students' Colloquium 2010, Perth, Australia*. Curtin Business School, Curtin University.

———. 2013. "Mobile Learning Characteristics and Challenges for Developing Countries – a Case Study of Pakistani Universities" *Curtin Business School*

Doctoral Students' Colloquium 2013, Perth, Australia: Curtin Business School, Curtin University.

Imtinan, U., V. Chang, and T. Issa. 2010. "Developing a Mobile Learning Conceptual Model for Universities in Pakistan" *IADIS international conference: Internet Technologies and Society 2010, Perth, Australia*: IADIS press.

———. 2011. "Literature Review of Mobile Learning in Developing Countries." In *The Eighteenth International Conference on Learning*, *Mauritius*.

———. 2012a. "Characteristics of Mobile Learning Environments in Developing Countries." *The International Journal of Learning* 18 (5): 163-173.

———. 2012b. "Mobile Learning-Theoretical Underpinnings" *IADIS International Conference - Internet Technologies & Society, Perth, Australia*: IADIS Press.

———. 2013a. "Common Mobile Learning Characteristics - an Analysis of Mobile Learning Models and Frameworks" *IADIS Mobile Learning 2013, Lisbon, Portugal*: IADIS Press.

———. 2013b. "Offline Mobile Learning: A Proposal to Promote Literacy in Pakistani Rural Areas" *Electric Dreams, 30th Ascilite Conference, Sydney, Australia,*2013. Macquarie University.

———. 2013c. "Usability Issues in Mobile Learning: Students' Perceptions in Pakistani Universities" *12th World Conference on Mobile and Contextual Learning (mLearn 2013), Doha, Qatar*: QScience.

———. 2014. "Envisioning Mobile Learning as the Future of Teaching and Learning Via Technology: A Literature Review of Mobile Learning." In *Multicultural Awareness and Technology in Higher Education: Global Perspectives*, eds Tomayess Issa, Pedro Isaias and Piet Kommers. IGI Global.

Issa, G. F., H. Al–Bahadili, and M. Abuhamdeh. 2011. "A Scalable Framework to Quantitatively Evaluate Success Factors of Mobile Learning Systems." *International Journal of Mobile Learning and Organisation* 5 (3): 299-316.

Jeffrey, L. M. 2009. "Learning Orientations: Diversity in Higher Education." *Learning and Individual Differences* 19 (2): 195-208.

Johnston, J. M., G. M. Leung, K. Y. K. Tin, L. M. Ho, W. Lam, and R. Fielding. 2004. "Evaluation of a Handheld Clinical Decision Support Tool for Evidence-Based Learning and Practice in Medical Undergraduates." *Medical Education* 38 (6): 628-637.

Kambil, Ajit, and Erik Eselius. 2000. "Where the Interaction Is." *Across the Board* 37 (10): 36.

Kaplan, B., and D. Duchon. 1988. "Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study." *MIS Quarterly* 12 (4): 571-586.

Keegan, D. 2005. "The Incorporation of Mobile Learning into Mainstream Education and Training" *mLearn2005*,

Keen, Peter G. W. 1990. "Relevance and Rigor in Information Systems Research: Improving Quality, Confidence, Cohesion and Impact" *Information systems*

research: contemporary approaches and emergent traditions, *Copenhagen, Denmark*: Elsevier Science.

Keengwe, J., and M. Bhargava. 2013. "Mobile Learning and Integration of Mobile Technologies in Education." *Education and Information Technologies*: 1-10. doi: 10.1007/s10639-013-9250-3.

Keskin, N. O, and D. Metcalf. 2011. "The Current Perspectives, Theories and Practices of Mobile Learning." *TOJET* 10 (2).

Khazanchi, D., and E. Munkvold. 2000. "Is Information System a Science? An Inquiry into the Nature of the Information Systems Discipline." *SIGMIS Database* 31 (3): 24-42.

Kiili, K. 2002. "Evaluating Wap Usability: "What Usability?"." edited by M. Milrad, U. Hoppe and Kinshuk, Unsupported: Conference Proceeding Vaxjo, Sweden: IEEE Computer Society.

Kim, P. 2009. "Action Research Approach on Mobile Learning Design for the Underserved." *Educational Technology, Research and Development* 57 (3): 415.

Kim, P., T. Miranda, and C. Olaciregui. 2008. "Pocket School: Exploring Mobile Technology as a Sustainable Literacy Education Option for Underserved Indigenous Children in Latin America." *International Journal of Educational Development* 28 (4): 435-445.

King, J. L. 1993. "Editorial Notes." *Information Systems Research* 4 (4): 291-298.

Klein, H. K., and D. M Myers. 1999. "A Set of Principles for Conducting and Evaluation Interpretive Field Studies in Information Systems." *MIS Quarterly* 23 (1): 67-94.

Klopfer, E., K. Squire, and H. Jenkins. 2002. "Environmental Detectives: Pdas as a Window into a Virtual Simulated World." edited by M. Milrad, U. Hoppe and Kinshuk, Vaxjo, Sweden: IEEE Computer Society.

Könönen, V., J. Mäntyjärvi, H. Similä, J. Pärkkä, and M. Ermes. 2010. "Automatic Feature Selection for Context Recognition in Mobile Devices." *Pervasive and Mobile Computing* 6 (2): 181-197.

Koole, M. L. 2009. "A Model for Framing Mobile Learning." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 25-47. AU Press Canada.

Krueger, R., and M. Casey. 2000. *Focus Groups: A Practical Guide for Applied Research*. London: Sage Publications.

Kukulska-Hulme, A. 2005a. "Introduction." In *Mobile Learning: A Handbook for Educators and Learners*, eds Agnes Kukulska-Hulme and John Traxler, 1-6. London and New York: RoutledgeFalmer.

———. 2005b. "Mobile Usability and User Experience." In *Mobile Learning: A Handbook for Educators and Trainers*, eds Agnes Kukulska-Hulme and John Traxler, 46-56. London and New York: RoutledgeFalmer.

———. 2009. "Will Mobile Learning Change Language Learning?" *ReCALL : the Journal of EUROCALL* 21 (2): 157.

———. 2010. "Charting Unknown Territory: Models of Participation in Mobile Language Learning." *International Journal of Mobile Learning and Organisation* 4 (2): 116-129.

———. 2012. "How Should the Higher Education Workforce Adapt to Advancements in Technology for Teaching and Learning?" *The Internet and Higher Education* 15 (4): 247-254.

Kukulska-Hulme, A., and L. Shield. 2008. "An Overview of Mobile Assisted Language Learning: From Content Delivery to Supported Collaboration and Interaction." *ReCALL : the Journal of EUROCALL* 20 (3): 271.

Kukulska-Hulme, A., and J. Traxler, eds. 2005. *Mobile Learning: A Handbook for Educators and Trainers, Open and Flexible Learning Series*. London and New York: RoutledgeFalmer.

Kumar, A., Anuj T., Geeta S., Deepti C., Matthew K., and John C. 2010. "An Exploratory Study of Unsupervised Mobile Learning in Rural India." In *Proceedings of the 28th international conference on Human factors in computing systems, Atlanta, Georgia, USA*, 743-752. 1753435: ACM.

Kurti, A., D. Spikol, and M. Milrad. 2008. "Bridging Outdoors and Indoors Educational Activities in Schools with the Support of Mobile and Positioning Technologies." *International Journal of Mobile Learning and Organisation* 2 (2): 166-186.

Kwon, S., and J. E. Lee. 2010. "Design Principles of M-Learning for Esl." *Procedia - Social and Behavioral Sciences* 2 (2): 1884-1889.

Lacey, A., and L. Donna. 2001. *Trent Focus for Research and Development in Primary Health Care: An Introduction to Qualitative Analysis*. Sheffield: Trent Focus.

Lai, KW., F. Khaddage, and G. Knezek. 2013. "Blending Student Technology Experiences in Formal and Informal Learning." *Journal of Computer Assisted Learning* 29 (5): 414-425.

Lalji, Z., and J. Good. 2008. "Designing New Technologies for Illiterate Populations: A Study in Mobile Phone Interface Design." *Interacting with Computers* 20 (6): 574-586.

Lan, Y., and Y. Sie. 2010. "Using Rss to Support Mobile Learning Based on Media Richness Theory." *Computers & Education* 55 (2): 723-732.

Laurillard, D. 2007. "Pedagogical Forms for Mobile Learning." In *Mobile Learning: Towards a Research Agenda*, ed. N. Pachler. London: WLE Centre, IoE.

Lave, J., and E. Wenger. 1991. *Situated Learning: Legitimate Peripheral Participation.* Cambridge, England: Cambridge University Press.

Liaw, S., M. Hatala, and H. Huang. 2010. "Investigating Acceptance toward Mobile Learning to Assist Individual Knowledge Management: Based on Activity Theory Approach." *Computers & Education* 54 (2): 446-454.

Litchfield, A., L. Dyson, E. Lawrence, and A. Zmijewska. 2007. "Directions for M-Learning Research to Enhance Active Learning. In Ict: Providing Choices for Learners and Learning." *Ascilite, Singapore*: Ascilite.

Litoselliti, L. 2003. *Using Focus Groups in Research*. London: Continuum.

Looi, C., P. Seow, B. Zhang, H. So, W. Chen, and L. Wong. 2010. "Leveraging Mobile Technology for Sustainable Seamless Learning: A Research Agenda." *British Journal of Educational Technology* 41 (2): 154.

Low, L. 2007. "M-Learning Standards Report." edited by Department of Education Australian Government, Science and Training.

Lowery, R. C. 2005. "Teaching and Learning with Interactive Student Response Systems: A Comparison of Commercial Products in the Higher-Education Market." Unsupported: Conference Proceeding New Orleans, LA.

Lu, Y., and A. R. Korukonda. 2008. "Exploratory Investigation of Student Attitudes toward Technology Based on Wi-Fi Usage." *International Journal of Mobile Learning and Organisation* 2 (3): 283-300.

Luanrattana, R., K. T. Win, J. Fulcher, and D. Iverson. 2010. "Adoption of Mobile Technology in a Problem-Based Learning Approach to Medical Education." *International Journal of Mobile Learning and Organisation* 4 (3): 294-316.

Lundin, J., G. Lymer, L. E. Holmquist, B. Brown, and Mattias R. 2010. "Integrating Students's Mobile Technology in Higher Education." *International Journal of Mobile Learning and Organisation* 4 (1): 1-14.

MacCallum, K. 2008. "Mobile Technology in Collaboration: Evaluation of a Web-Based Discussion Board." *International Journal of Mobile Learning and Organisation* 2 (4): 318-328.

Madge, C., J. Meek, J. Wellens, and T. Hooley. 2009. "Facebook, Social Integration and Informal Learning at University: It Is More for Socialising and Talking to Friends About Work Than for Actually Doing Work." *Learning, Media and Technology* 34 (2): 141 - 155.

Mahmood, K. 2005. *The Use of Animated Software Agents Support in E-Learning Environments: An Exploratory Interpretive Case Study., Informatics Research Institute (Iris).* Salford: University of Salford.

Maria, F. C., A. Antonella De, L. Rosa, A. Carmelo, B. Paolo, and P. Thomas. 2008. "Explore! Possibilities and Challenges of Mobile Learning." In *Proceeding of the twenty-sixth annual SIGCHI conference on Human factors in computing systems, Florence, Italy*. ACM.

Martí, M., and G. Ferrer. 2012. "Exploring Learners' Practices and Perceptions on the Use of Mobile Portfolios as Methodological Tool to Assess Learning in Both Formal and Informal Contexts." *Procedia - Social and Behavioral Sciences* 46 (0): 3182-3186.

Masters, K. 2005. "Low-Key M-Learning: A Realistic Introduction of M-Learning to Developing Countries." In *Seeing, Understanding, Learning in the Mobile Age*.

McConatha, D., C. Penny, D. Bolton, and J. schugar. 2013. Mobile Pedagogy. Accessed 20-12-2013, http://mobilepedagogy.com/.

McConatha, D., C. Penny, J. Schugar, and D. Bolton. 2014. *Mobile Pedagogy and Perspectives on Teaching and Learning*. Vol. Hershey, PA, USA: IGI Global.

McManus, T. 2002. "Mobile What? The Educational Potential of Mobile Technologies" *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*,

Meawad, F., and G. Stubbs. 2008. "A Framework for Enabling on-Demand Personalised Mobile Learning." *International Journal of Mobile Learning and Organisation* 2 (2): 133-148.

Memon, G.R, M. F. Joubish, and M. A. Khurram. 2010. "Impact of Parental Socio-Economic Status on Students' Educational Achievements at Secondary Schools of District Malir, Karachi." *Middle-East Jounral of Scientific Research* 6 (6): 678-687.

Mifsud, L. 2002a. "Alternative Learning Arenas – Pedagogical Challenges to Mobile Learning Technology in Education." edited by M. Milrad, U. Hoppe and Kinshuk, Unsupported: Conference Proceeding Vaxjo, Sweden: IEEE Computer Society.

Mifsud, Louise. 2002b. "Alternative Learning Arenas-Pedagogical Challenges to Mobile Learning Technology in Education" *Proceedings of IEEE Workshop on Wireless and Mobile Technologies in Education-WMTE'02*,

Mike, S., C. Dan, and W. Oliver. 2002. "The Design and Implementation of a Mobile Learning Resource." *Personal and Ubiquitous Computing* 6 (3): 220.

Miles, M., and M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. London: Sage Publications.

Mohamad, M. 2012. "Issues and Challenges in Implementing Mobile Learning in Malaysian Schools."

Morgan, D. L. 1997. *Focus Groups as Qualitative Research*. Second Edition ed. Vol. 16, *Qualitative Research Methods Series*. Thousand Oaks, California: SAGE Publications, Inc.

Motiwalla, L. F. 2007. "Mobile Learning: A Framework and Evaluation." *Computers & Education* 49 (3): 581-596.

Motlik, S. 2008. "Mobile Learning in Developing Nations." *International Review of Research in Open and Distance Learning* 9 (2).

Mulliah, A., and E. Stroulia. 2009. "Mobile Devices for Collaborative Learning in Practicum Courses." *International Journal of Mobile Learning and Organisation* 3 (1): 44-59.

Myers, M. D. 2009. *Qualitative Research in Business and Management*. Los Angeles ; London: SAGE.

N., Laura, and M. P. S. 2009. "Using Mobile Technologies for Multimedia Tours in a Traditional Museum Setting." In *Mobile Learning*, ed. M. Ally, 247-264.

Naismith, L., P. Lonsdale, G. Vavoula, and M. Sharples. 2004a. *Literature Review in Mobile Technologies and Learning*. Bristol: NESTA FutureLab.

Naismith, Laura, Peter Lonsdale, Giasemi Vavoula, and Mike Sharples. 2004b. *Literature Review in Mobile Technologies and Learning*. Futurelab.

Ng, W. 2011. *Mobile Technologies and Handheld Devices for Ubiquitous Learning: Research and Pedagogy*. Vol. Hershey, PA, USA: IGI Global.

Nordin, N., M. Embi, and M. Yunus. 2010. "Mobile Learning Framework for Lifelong Learning." *Procedia - Social and Behavioral Sciences* 7 (0): 130-138.

Nyíri, K. 2003. *Mobile Learning: Essays on Philosophy, Psychology and Education*: Passagen Verlag.

O'Malley, C., G. Vavoula, J. Glew, J. Taylor, M. Sharples, and P Lefrere. 2003. Guidelines for Learning/Teaching/Tutoring in a Mobile Environment. *Mobilearn project deliverable*,

Oates, B. J. 2006. *Researching Information Systems and Computing*. London: Sage Publications.

Ogata, H., G. L. Hui, C. Yin, T. Ueda, Y. Oishi, and Y. Yano. 2008. "Loch: Supporting Mobile Language Learning Outside Classrooms." *International Journal of Mobile Learning and Organisation* 2 (3): 271-282.

Oliver, B. W. F. 2007. "What Is Quality University Learning and How Might Micro-Learning Help to Achieve It? ." In *Didactics of Microlearning*, ed. Theo Hug, 365-378. Waxman.

Oliver, B. W. F., and V. Goerke. 2007. "Australian Undergraduates' Use and Ownership of Emerging Technologies: Implications and Opportunities for Creating Engaging Learning Experiences for the Net Generation." *Australasian Journal of Educational Technology* 23 (2): 171-186.

———. 2008. "Undergraduate Students' Adoption of Handheld Devices and Web 2.0 Applications to Supplement Formal Learning Experiences: Case Studies in Australia, Ethiopia and Malaysia." *International Journal of Education and Development using ICT* 4 (3): 1-14.

Oliver, M., A. M. Mee, K. Logan, R. Graber, W. Clark, and R. Luckin. 2009. "Do Web 2.0 Tools Really Open the Door to Learning? Practices, Perceptions and Profiles of 11-16-Year-Old Students." *Learning, Media and Technology* 34 (2): 87.

Omar, A., L. C. Liu, and K. S. Koong. 2008. "From Disaster Recovery to Mobile Learning: A Case Study." *International Journal of Mobile Learning and Organisation* 2 (1): 4-17.

Orlikowski, W. J., and J. J. Baroudi. 1991. "Studying Information Technology in Organizations: Research Approaches and Assumptions." *Information Systems Research (The Institute of Management Sciences)* 2 (1): 1-28.

Ozdamli, F. 2012. "Pedagogical Framework of M-Learning." *Procedia - Social and Behavioral Sciences* 31 (0): 927-931.

Ozdamli, F., and N. Cavus. 2011. "Basic Elements and Characteristics of Mobile Learning." *Procedia - Social and Behavioral Sciences* 28 (0): 937-942. doi: 10.1016/j.sbspro.2011.11.173.

Ozok, A. A., and J. Wei. 2007. "Short Messaging Service Use among College Students in USA and Its Potential as an Educational Tool: An Exploratory Study." *International Journal of Mobile Learning and Organisation* 1 (4): 355-374.

Pachler, N., B. Bachmair, and J. Cook. 2010. *Mobile Learning: Structures, Agency, Practices*. New York, London: Springer.

Pachler, N., J. Cook, and B. Bachmair. 2012. "Appropriation of Mobile Cultural Resources for Learning." In *Refining Current Practices in Mobile and Blended Learning: New Applications*, 10-30. IGI Global.

Palfrey, J., and U. Gasser. 2008. *Born Digital : Understanding the First Generation of Digital Natives*: New York : Basic Books.

Papert, S. 1980. *Mindstorms: Children,Computers, and Powerful Ideas.* Brighton: Harvester Press.

Parr, C. S. J. T., amp, and S. N. B. 2004. "Evaluation of a Handheld Data Collection Interface for Science Learning." *Journal of Science Education & Technology* 13 (2): 233-242.

Parsons, D. 2011. *Combining E-Learning and M-Learning: New Applications of Blended Educational Resources*. Vol. Hershey, PA, USA: IGI Global.

———. 2013. *Innovations in Mobile Educational Technologies and Applications*. Vol. Hershey, PA, USA: IGI Global.

Parsons, D., R. Hokyoung, and M. Cranshaw. 2006. "A Study of Design Requirements for Mobile Learning Environments" *Advanced Learning Technologies, 2006. Sixth International Conference on*,

Parsons, D., and H. Ryu. 2009. "Designing Learning Activities with Mobile Technologies." In *Innovative Mobile Learning: Techniques and Technologies*, eds David Parsons and Hokyoung Ryu, 1-20. Hershey - New York: IGI Global.

Patten, B., I. Arnedillo Sánchez, and B. Tangney. 2006. "Designing Collaborative, Constructionist and Contextual Applications for Handheld Devices." *Computers & Education* 46 (3): 294-308.

Pavlov, I. P. 1927. *Conditioned Reflexes*. London: Routledge and Kegan Paul.

Pérez-Sanagustín, M., G. Ramirez-Gonzalez, D. Hernández-Leo, M. Muñoz-Organero, P. Santos, J. Blat, and C. Delgado Kloos. 2012. "Discovering the Campus Together: A Mobile and Computer-Based Learning Experience." *Journal of Network and Computer Applications* 35 (1): 176-188.

Perry, D. 2003. *Handheld Computers (Pdas) in Schools*. London: Becta.

PERN. 2009. Pakistan Education and Research Network. Higher Education

Commission, Pakistan. Accessed 14/11/09, http://pern.edu.pk/.

Peter, S., and B. Barney. 2007. "Blended Learning: An Introduction in Blended Learning " In *Using Technology in and Beyond the Language Classroom*, 7-15. Oxford: Macmillan.

Peters, K. 2009. "M-Learning: Positioning Educators for a Mobile, Connected Future." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 113-132. AU Press Canada.

Petrova, K. 2010. "An Implementation of an Mlearning Scenario Using Short Text Messaging: An Analysis and Evaluation." *International Journal of Mobile Learning and Organisation* 4 (1): 83-97.

Piaget, J. 1929. *The Child's Conception of the World.* New York: Harcourt, Brace Jovanovich.

Pieri, M., and D. Diamantini. 2009. "From E-Learning to Mobile Learning: New Opportunities." In *Mobile Learning: Transforming the Delivery of Education and Training*, ed. Mohamed Ally, 183-194. AU Press Canada.

Premadasa, HK., R. Meegama, and N. Gayan. 2013. "Mobile Learning Environment with Short Messaging Service: Application to a Campus Environment in a Developing Country." *Campus-Wide Information Systems* 30 (2): 106-123.

Prensky, M. 2009. The 21st-Century Digital Learner: How Tech-Obsessed Ikids Would Improve Our Schools.

Proctor, N., and J. Burton. 2003a. "Tate Modern Multimedia Tour Pilots 2002-2003." Unsupported: Conference Proceeding.

———. 2003b. "Tate Modern Multimedia Tour Pilots 2002–2003 " *mLearn2003: Learning with Mobile Devices. Research and Development*: Learning and Skills Development Agency, London.

PTA. 2009. Pta-Press Releases: Pakistan Telecom Authority. Accessed March 28, 2010, http://www.pta.gov.pk.

———. 2013. Pakistan Telecommunication Authority Media Centre. Accessed 21-03-2013, http://www.pta.gov.pk.

QSR. 2013. Qsr Nvivo 10: Qualitative Data Analysis Software. http://www.qsrinternational.com/.

Rainger, P. 2005. "Accessibility and Mobile Learning." In *Mobile Learning: A Handbook for Educators and Trainers*, eds Agnes Kukulska-Hulme and John Traxler, 57-69. London and New York: RoutledgeFalmer.

Rau, P. P., Q. Gao, and L. Wu. 2008. "Using Mobile Communication Technology in High School Education: Motivation, Pressure, and Learning Performance." *Computers & Education* 50 (1): 1-22.

Roschelle, J. 2003. "Unlocking the Learning Value of Wireless Mobile Devices." *Journal of Computer Assisted Learning* 19 (3): 260-272.

Ruchter, M., B. Klar, and W. Geiger. 2010. "Comparing the Effects of Mobile Computers and Traditional Approaches in Environmental Education." *Computers & Education* 54 (4): 1054-1067.

Ryan, G. W. , and H. R. Bernerd. 2003. "Techniques to Identify Themes." *Field Methods* 15 (1): 85-109.

Ryu, H., and D. Parsons. 2009. *Innovative Mobile Learning: Techniques and Technologies*. Vol. Hershey, PA, USA: IGI Global.

Sahilu, S. W., W. F. Ahmad, and N. S. Haron. 2010. "Development and Usability Evaluation of Platform Independent Mobile Learning Tool (M-Lt)." *International Journal of Computer and Information Engineering* 4 (4).

Saif, U. 2013. Leveraging Mobile Phones for Primary Education in Pakistan. http://www.weforum.org.

Santos, A. C., J. M. P. Cardoso, D. R. Ferreira, P. C. Diniz, and P. Chaínho. 2010. "Providing User Context for Mobile and Social Networking Applications." *Pervasive and Mobile Computing* 6 (3): 324-341.

Sari, E., and A. Tedjasaputra. 2008. "Exploring Potentials and Challenges of Mobile Ict for Learning in Finland and Indonesia." *International Journal of Mobile Learning and Organisation* 2 (2): 103-118.

Savill-Smith, C. 2005. "The Use of Palmtop Computers for Learning: A Review of the Literature." *British Journal of Educational Technology* 36 (3): 567-568.

Schneider, O., U. Bleimann, and I. Stengel. 2009. "Atlantis University: Learn Your Own Way." *International Journal of Mobile Learning and Organisation* 3 (2): 184-201.

Scornavacca, E., S. Huff, and S. Marshall. 2009. "Understanding the Value of Interactive Sms for Large Classes." In *Innovative Mobile Learning: Techniques and Technologies*, eds David Parsons and Hokyoung Ryu, 48-59. Hershey - New York: Information science reference.

Selwyn, N. 2009. "Faceworking: Exploring Students' Education-Related Use of <I>Facebook</I>." *Learning, Media and Technology* 34 (2): 157 - 174.

Sharples, M. 2002. "Disruptive Devices: Mobile Technology for Conversational Learning." *International Journal of Continuing Engineering Education and Life Long Learning* 12 (5/6): 504-520.

Sharples, M., J. Taylor, and G. Vavoula. 2005. "Towards a Theory of Mobile Learning" *MLearn*, 2006.

———. 2007. "A Theory of Learning for the Mobile Age." In *The Sage Handbook of Elearning Research*, eds R. Andrews and C. Haythornthwaite. London: Sage.

———. 2010. "A Theory of Learning for the Mobile Age." In *Medienbildung in Neuen Kulturräumen*, ed. Ben Bachmair, 87-99. VS Verlag für Sozialwissenschaften.

Shen, R., M. Wang, and X. Pan. 2008. "Increasing Interactivity in Blended Classrooms through a Cutting-Edge Mobile Learning System." *British Journal of Educational Technology* 39 (6): 1073.

Sheng, H., F. F. Nah, and K. Siau. 2005. "Strategic Implications of Mobile Technology: A Case Study Using Value-Focused Thinking." *The Journal of Strategic Information Systems* 14 (3): 269-290.

Shrestha, S., J. P. T. Moore, and J. Abdelnour-Nocera. 2010. "Offline Mobile Learning: Open Platforms for Ict4d" *Advanced Learning Technologies (ICALT), 2010 IEEE 10th International Conference*,

Sife, A., E. Lwoga, and C. Sanga. 2007. "New Technologies for Teaching and Learning: Challenges for Higher Learning Institutions in Developing Countries." *International Journal of Education and Development using ICT [Online]* 3 (2).

Sims, M. 2013. Why Have Authorities Failed Thrice in Auctioning the 3g Spectrum? *The Express Tribune,* http://tribune.com.pk/.

Skinner, B. F. 1968. *The Technology of Teaching.* New York: Appleton-Century-Crofts (reprinted by the BF Skinner Foundation in 2003).

Smith, K. J., and S Forman. 2014. "Bring Your Own Device-Challenges and Solutions for the Mobile Workplace." *Employment Relations Today* 40 (4): 67-73.

Smordal, O., and J. Gregory. 2003. "Personal Digital Assistants in Medical Education and Practice." *Journal of Computer Assisted Learning* 19 (3): 320.

Smordal, O., J. Gregory, and K. Langseth. 2002. "Pdas in Medical Education and Practice." edited by M. Milrad, U. Hoppe and Kinshuk, Unsupported: Conference Proceeding Vaxjo, Sweden: IEEE Computer Society.

Song, Y. 2008. "Sms Enhanced Vocabulary Learning for Mobile Audiences." *International Journal of Mobile Learning and Organisation* 2 (1): 81-98.

———. 2011. "Investigating Undergraduate Student Mobile Device Use in Context." In *Models for Interdisciplinary Mobile Learning: Delivering Information to Students*, 120-136. IGI Global.

———. 2014. "Bring Your Own Device (Byod) for Seamless Science Inquiry in a Primary School." *Computers & Education* 74 (0): 50-60.

Sørebø, Ø., H. Halvari, V. F. Gulli, and R. Kristiansen. 2009. "The Role of Self-Determination Theory in Explaining Teachers' Motivation to Continue to Use E-Learning Technology." *Computers & Education* 53 (4): 1177-1187.

Spikol, D., Arianit K., and Marcelo M. 2009. "Collaboration in Context as a Framework for Designing Innovative Mobile Learning Activities." In *Innovative Mobile Learning: Techniques and Technologies*, eds David Parsons and Hokyoung Ryu, 172-196. Hershey - New York: Information science reference.

Stead, G. 2014. "Open Formats for Mobile Learning." In *Increasing Access through Mobile Learning*, eds Mohamed Ally and Avgoustos Tsinakos, 99-111. Vancouver: Commonwealth of Learning and Athabasca University.

Steve, V. 2012. "Unesco Policy Guidelines for Mobile Learning." edited by UNESCO, Policy Document Paris, France: UNESCO.

Stockwell, G. 2008. "Investigating Learner Preparedness for and Usage Patterns of Mobile Learning." *ReCALL : the Journal of EUROCALL* 20 (3): 253.

Straub, D. W., and C. L. Carlson. 1989. "Validating Instruments in Mis Research." 13 (2): 147-169.

Taylor, J., M. Sharples, C. O'Malley, G. Vavoula, and J. Waycott. 2006. "Towards a Task Model for Mobile Learning:A Dialectical Approach." *International Journal of Learning Technology* (2): 138–158.

Thüs, H., M. Chatti, E. Yalcin, C. Pallasch, B. Kyryliuk, T. Mageramov, and U. Schroeder. 2012. "Mobile Learning in Context." *International Journal of Technology Enhanced Learning* 4 (5): 332-344.

Ting, Y. 2013. "Using Mobile Technologies to Create Interwoven Learning Interactions: An Intuitive Design and Its Evaluation." *Computers & Education* 60 (1): 1-13.

Traxler, J. 2009. "Current State of Mobile Learning." In *Mobile Learning: Transforming the Delivery of Education & Training*, ed. Muhammad Ally, 9-24. AU Press.

Traxler, J. 2005. "Defining Mobile Learning" *IADIS International Conference Mobile Learning*,

———. 2011. "Learning in a Mobile Age, a More and More Mobile Age." In *Combining E-Learning and M-Learning: New Applications of Blended Educational Resources*, 15-27. IGI Global.

———. 2013. "Mobile Learning: Shaping the Frontiers of Learning Technologies in Global Context." In *Reshaping Learning*, 237-251. Springer.

Traxler, J., and A. Kukulska-Hulme. 2005. *Mobile Learning in Developing Countries: The Knowledge Series. Commonwealth of Knowledge*. Vancouver, Canada: Commonwealth of Learning.

Uden, L. 2007. "Activity Theory for Designing Mobile Learning." *International Journal of Mobile Learning and Organisation* 1 (1): 81-102.

Ugray, Z. 2009. "Security and Privacy Issues in Mobile Learning." *International Journal of Mobile Learning and Organisation* 3 (2): 202-218.

UNESCO. 2005. *International Workshop on Mobile Learning for Expanding Educational Opportunities*. Tokyo, Japan.

———. 2010. *Unesco & Mobilink, Driving Female Literacy through Connectivity*. Islamabad.

———. 2013a. Call for Proposals Unesco Mobile Learning Week 2014. http://en.unesco.org/events/mobile-learning-week-2014.

———. 2013b. Mobile Learning Projects to Empower Rural Women in Pakistan. http://www.unescobkk.org.

Uther, M. 2002. "Mobile Internet Usability: What Can `Mobile Learning' Learn from the Past?" edited by M. Milrad, U. Hoppe and Kinshuk, Unsupported: Conference Proceeding Vaxjo, Sweden: IEEE Computer Society.

Uzunboylu, H., and F. Ozdamli. 2011. "Teacher Perception for M-Learning: Scale Development and Teachers' Perceptions." *Journal of Computer Assisted Learning* 27 (6): 544-556.

Vavoula, G. N., and M. Sharples. 2002. "Kleos: A Personal, Mobile, Knowledge and Learning Organisation System." In *Wireless and Mobile Technologies in Education*, 152-156.

Vavoula, G., N. Pachler, and A. Kukulska-Hulme, eds. 2009. *Researching Mobile Learning*: Peter Lang.

Vygotsky, L. S. 1978. *Mind and Society*. Cambridge, MA: Harvard University Press.

Wains, S. I., and W. Mahmood. 2008. "Integrating M-Learning with E-Learning." In *Proceedings of the 9th ACM SIGITE conference on Information technology education, Cincinnati, OH, USA*. ACM.

Wali, E., N. Winters, and M. Oliver. 2008. "Maintaining, Changing and Crossing Contexts: An Activity Theoretic Reinterpretation of Mobile Learning." *ALT-J* 1 (16): 41-57.

Walsham, G. 1995. "The Emergence of Interpretivism in Is Research." *Information Systems Research* 6 (4): 376-394.

Wan, N., and N. Howard. 2007. "Ubiquitous Learning with Handheld Computers in Schools" *mLearn Melbourne, Australia*: University of Melbourne.

Wang, M., R. Shen, D. Novak, and X. Pan. 2009. "The Impact of Mobile Learning on Students' Learning Behaviours and Performance: Report from a Large Blended Classroom." *British Journal of Educational Technology* 40 (4): 673.

Wang, P., and H. Ryu. 2009. "Not Sms, but Mobile Quizzes: Designing a Mobile Learning Application for University Students." *International Journal of Mobile Learning and Organisation* 3 (4): 351-365.

Wei, J., J. Zhuo, and H. Zhang. 2008. "Development of a Mobile Learning Model with Usability Features for Online Education." *International Journal of Mobile Learning and Organisation* 2 (1): 18-35.

Welsh, E. 2002. "Dealing with Data: Using Nvivo in the Qualitative Data Analysis Process" *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*,

Winters, N. 2007. "What Is Mobile Learning?" In *Big Issues in Mobile Learning: A Report of a Workshop by the Kaleidoscope Network of Excellence Mobile Learning Initiative.*, ed. M Sharples. London.

Wishart, J., and P. Triggs. 2010. "Museumscouts: Exploring How Schools, Museums and Interactive Technologies Can Work Together to Support Learning." *Computers & Education* 54 (3): 669-678.

WorldBank. 2009. World Bank: Ict at a Glance. [Statistical Reports]. World Bank. 28/08/09 Accessed Aug 28, 2009, http://go.worldbank.org.

———. 2011. Ict at a Glance. WorldBank. Accessed Feb 10, 2012, http://www.worldbank.org.

Wu, W., Y. Jim, C. Chen, H. Kao, C. Lin, and S. Huang. 2012. "Review of Trends from Mobile Learning Studies: A Meta-Analysis." *Computers & Education* 59 (2): 817-827. doi: 10.1016/j.compedu.2012.03.016.

Yin, R. 2009. *Case Study Research : Design and Methods / Robert K. Yin*.

Young, P., E. Moore, G. Griffiths, R. Raine, R. Stewart, M. Cownie, and M. Frutos-Perez. 2009. "Help Is Just a Text Away: The Use of Short Message Service Texting to Provide an Additional Means of Support for Health Care Students During Practice Placements." *Nurse Education Today* In Press, Corrected Proof.

Zurita, G, and M. Nussbaum. 2007. "A Conceptual Framework Based on Activity Theory for Mobile Cscl." *British Journal of Educational Technology* 38 (2): 211.

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APPENDICES

APPENDIX A

Participant Information Sheet

My name is Umera Imtinan. I am currently completing a PhD research entitled as "Identifying mobile learning characteristics for universities in Pakistan" at Curtin University, Australia.

Purpose of Research

In this research, I am investigating the characteristics of mobile learning for Pakistani universities' environment.

Your Role

I am interested in exploring your opinions about mobile learning characteristics for Pakistani universities' environment. I will ask you questions regarding your opinion on certain mobile learning characteristics for Pakistani universities' environment. I will provide you with a list of questions. The interview will take 30 to 40 minutes of your time. The session will be conducted in Urdu. With your permission, I will record the interview in audio format. The recorded data will be translated into English.

Consent to Participate

Your involvement in this research is entirely voluntary. You have the right to withdraw at any stage without it affecting your rights or my responsibilities. You will be invited to sign a consent form. When you have signed the consent form I will assume that you have agreed to participate and allow me to use your data in this research.

Confidentiality

The information you provide will be kept separate from your personal details. My supervisors and I will only have access to this information. The interview transcript

will not have your name or any other identifying information on it and in adherence to the university policy, the recorded interview and transcribed information will be kept in a locked cabinet for five years, before it is destroyed.

Further Information

This study has been approved by the Curtin University Human Research Ethics Committee (Approval Number IS_10_13). If needed, verification of approval can be obtained either by writing to the Curtin University Human Research Ethics Committee, c/- Office of Research and Development, Curtin University of Technology, GPO Box U1987, Perth, 6845 or by telephoning 9266 2784 or emailing hrec@curtin.edu.au

APPENDIX B

Cover Letter

Dear Sir/Madam,

I am currently undertaking a PhD research at Curtin University, Australia on the topic of identifying mobile learning characteristics for university environments in Pakistan. I would like to invite you to participate in a focus group discussion on the topic. The focus group discussion will cover the importance of using mobile devices for learning purposes in the Pakistani university environment.

Overview of the study

The study will be focusing on theorising mobile learning for the Pakistani universities. Mobile learning involves using mobile devices as learning tools and accessing learning resources outside the academic premises to allow the learning process to be more dynamic, flexible and collaborative.

Characteristics for mobile learning will be identified in Pakistani universities' context and a mobile learning conceptual model for the universities in Pakistan will be developed. The model will assist administrators and teachers to use mobile learning characteristics in universities in Pakistan. In addition, this model will provide the conceptual foundation for future research in mobile learning in Pakistani universities and other higher education institutions. The major objectives of the research are to:

1. Identify the characteristics for mobile learning in Pakistani universities' environment.

2. Investigate the perceptions and expectations of university administrators, students and teachers of mobile learning characteristics in Pakistani universities.

3. Develop a mobile learning conceptual model for Pakistani universities.

Currently, mobile learning has been theorized, applied and tested mainly in the developed countries. However, in spite of the advancement in mobile technologies, developing countries like Pakistan have not gained researcher's attention with respect to experimentation and conceptualization of mobile learning. Mobile learning characteristics need to be identified for Pakistan and other developing countries with respect to their own environments. To satisfy the objectives of this research, the following stakeholders' groups have been selected to participate in this research.

These stakeholders' groups include:

1. Students (as recipients of mobile learning)
2. Teachers (as deliverers of mobile learning)
3. Administrative authorities (as providers/facilitators of mobile learning)

The Data Collection

The data collection will be accomplished in two phases:

Phase One: During Phase one, students and teachers are invited to participate in Focus Groups discussion to express their opinion about mobile learning characteristics for Pakistani university environments.

Phase Two: Data from Phase one will be analyzed and the results will assist the researcher to conduct interviews with the administrative stakeholders such as educational managers, instructional designers and IT managers in the Phase two of this research.

The collected data from both phases will assist the researcher to evaluate and assess the mobile learning characteristics required for teaching and learning in Pakistani universities. It is anticipated that the Pakistani universities will use the new mobile learning model as a guide to upgrade their ICTs to include mobile learning for their teaching and learning purposes.

If you agree to participate, please email me on umera.imtinan@postgrad.curtin.edu.au. Upon receipt of your agreement, I will send you a schedule of the focus group discussion session. If you have any questions, please email umera.imtinan@postgrad.curtin.edu.au or you can contact my Supervisors Associate Professor Vanessa Chang vanessa.chang@cbs.curtin.edu.au or Dr Tomayess Issa tomayess.issa@cbs.curtin.edu.au

Yours faithfully,

Umera Imtinan

PhD Candidate,

School of Information Systems,

Curtin University,

Australia

APPENDIX C

CONSENT FORM

Title of PhD Research: Identifying Mobile Learning Characteristics for Universities in Pakistan

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- I have been provided with the participant information sheet.
- I understand that my involvement is voluntary and I can withdraw at any time without problem.
- I understand the purpose and procedures of the study.
- I understand that no personal identifying information like my name and address will be used and that all information will be securely stored for five years before being destroyed.
- I agree to participate in the study outlined to me.
- I agree for this discussion to be recorded in audio and video formats.
- I understand that all information provided is treated as confidential.
- I have been given the opportunity to ask questions.

Participant Name: _____ Signature: _____

Date: _____

Witness Name: _____ Signature: _____

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Researcher Name: _____ Signature: _____

Date: _____

APPENDIX D

Focus Groups Questions for Students in Pakistani Universities

1. How much time do you spend browsing the internet on your mobile device?
2. In the past few months, how often do you need technical (or IT) support when browsing the internet using your mobile device, for example accessing emails or engaging in social networking?
3. While using a mobile device for browsing the internet, for reading or writing emails and social networking, discuss any difficulties that you have faced?
4. Share your experiences about using a mobile device for learning.
5. List some of the learning activities you can perform using your mobile device.
6. If some part of your course is offered in a mobile learning mode, would you be interested to enroll in that course? Why?
7. Using your mobile device for learning, you will be able to access learning resources from anywhere and at any time; comment on this concept of flexibility in learning.
8. What is your opinion about using a mobile device to collaborate with peers and teachers when you are participating in the learning activities such as fieldwork and completing projects or assignments?
9. Using your mobile devices, you are able to gather additional information during fieldwork or learning excursions. Comment on this statement.
10. If the students are enrolled in a mobile learning mode for a course, they are capable of self-study or self-learning without much intervention from teachers. Comment on the statement.
11. What are your concerns when using a mobile device for learning?
12. In summary, what are your thoughts/expectations if mobile learning is introduced into a university environment in Pakistan?

APPENDIX E

Focus Groups Questions for Teachers in Pakistani Universities

1. How much time do you spend browsing the internet on your mobile device?
2. In the past few months, how often do you need technical (or IT) support when browsing the internet using your mobile device, for example accessing emails or engaging in social networking?
3. While using a mobile device for browsing the internet, for reading or writing emails and social networking, discuss any difficulties that you have faced?
4. Share your experiences about using a mobile device for teaching and learning.
5. List some of the teaching and learning activities you can perform using your mobile device.
6. If some part of your course is offered in a mobile learning mode, would you be interested to teach that course? Why?
7. To create teaching and learning content for mobile devices, what are your needs in terms of training and technical support?
8. Using your mobile device for teaching and learning, you will be able to access and update learning resources from anywhere and at any time; comment on this concept of flexibility in learning.
9. Using a mobile device will allow you to collaborate and communicate with your colleagues, also with your students when they are participating in the learning activities such as fieldwork and completing projects or assignments. Comment on this statement.
10. Using mobile devices, students are able to gather additional information during fieldwork or learning excursions, it can improve their critical thinking skills. Discuss this statement.
11. Using mobile devices for teaching and learning will allow students to be capable of self-study or self-learning without much intervention from teachers. Comment on the statement.

12. What are your concerns when using a mobile device for teaching and learning?
13. In summary, what are your thoughts/expectations if mobile learning is introduced into a university environment in Pakistan?

APPENDIX F

Interview Questions for Administrators in Pakistani Universities

1. Share your experiences/thoughts and concerns about using a mobile device for teaching and learning.
2. Given the list of some of the teaching and learning activities for mobile devices; share your thoughts.
3. Would you be interested to incorporate mobile learning in the courses offered at your university? Why or why not? Discuss.
4. To create teaching and learning content for mobile devices, how much support university may be able to provide in terms of training and technical support to teachers and students?
5. Using mobile devices for teaching and learning, students and teachers will be able to access and update learning resources from anywhere and at any time; comment on this concept of flexibility in learning.
6. Using mobile devices for learning will allow students and teachers to collaborate and communicate with each other when they are participating in the learning activities such as fieldwork and completing projects or assignments. Comment on this statement.
7. Using mobile devices for learning may assist the students to gather additional information during fieldwork or learning excursions. Discuss this statement.
8. Using mobile devices for teaching and learning will allow students to be capable of self-study or self-learning without much intervention from teachers. Comment on the statement.
9. In summary, what are your thoughts/expectations if mobile learning is introduced into a university environment in Pakistan?

APPENDIX G

Interview Questions for IT Managers in Pakistani Universities

1. How many students and teachers connect to the university network from mobile devices?
2. How often do students and teachers require technical (or IT) support when browsing the internet using mobile devices?
3. Share your experiences/thoughts about using a mobile device for teaching and learning.
4. Discuss any difficulties that students and teachers may face when using mobile devices/technologies for learning?
5. If some part of a course is offered in a mobile learning mode in the university, is it possible to provide seamless integration of mobile devices with Learning Management System?
6. To create teaching and learning content for mobile devices, would your department be able to train teachers and provide IT support?
7. In summary, what are your thoughts/expectations and concerns if mobile learning is introduced into a university environment in Pakistan?

APPENDIX H

Interview Questions for Instructional Designers in Pakistani Universities

1. While using mobile devices for learning, discuss any difficulties that students and teachers may face?
2. Share your experiences as well as concerns about using a mobile device for teaching and learning.
3. List some of the teaching and learning activities that can be performed by teachers and students using mobile devices.
4. If some part of a course is offered in a mobile learning mode, would you be able to design that part of the course into learning activities suitable for mobile devices?
5. To create teaching and learning content for mobile devices, what are students and teachers' needs in terms of training and technical support?
6. Using mobile device for teaching and learning, students and teachers will be able to access and update learning resources from anywhere and at any time; comment on this concept of flexibility in learning.
7. Using mobile devices for learning will allow students and teachers to collaborate and communicate with each other they are participating in the learning activities such as fieldwork and completing projects or assignments. Comment on this statement.
8. Using mobile devices for learning may assist the students to gather additional information during fieldwork or learning excursions. Discuss this statement.
9. Using mobile devices for teaching and learning will allow students to be capable of self-study or self-learning without much intervention from teachers. Comment on the statement.
10. In summary, what are your thoughts/expectations if mobile learning is introduced into a university environment in Pakistan?

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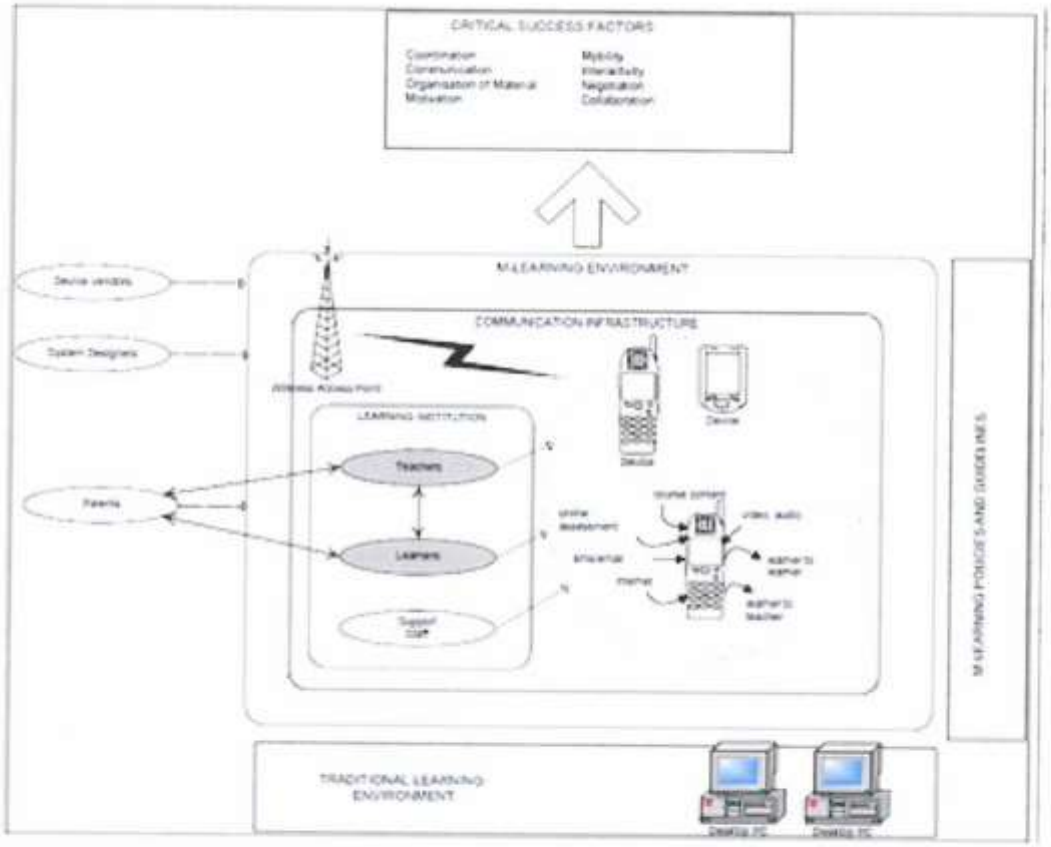

Figure1: A model for M-learning adoption (Source: Barker, Krull, and Mallinson 2005)

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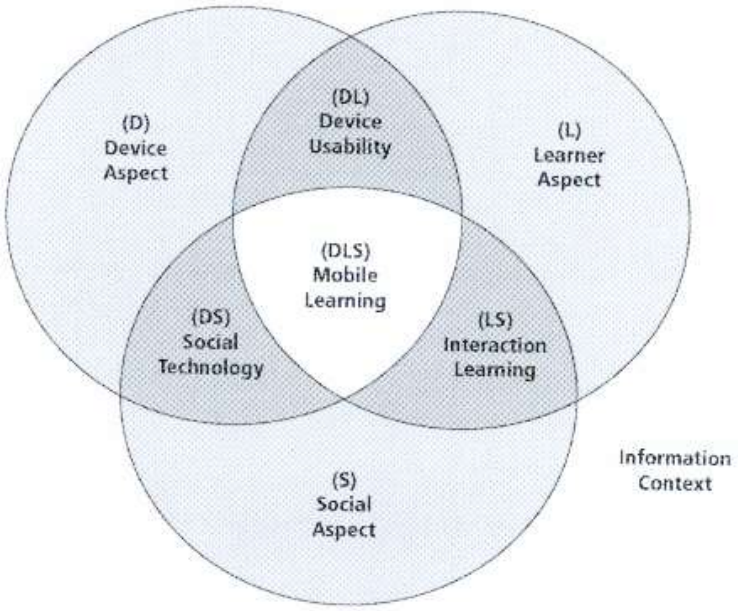

Figure1: The FRAME model (Source: Koole 2009)

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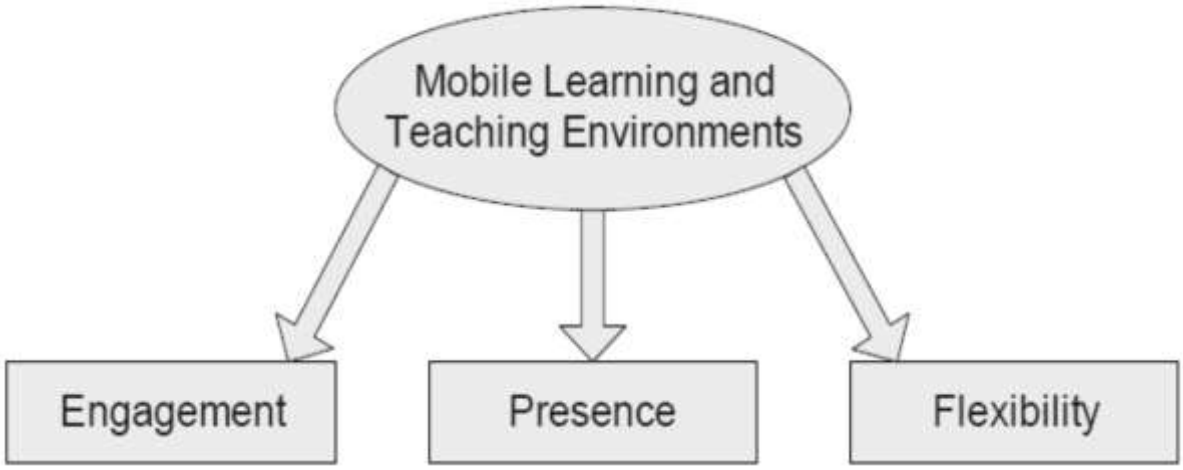

Figure1: A conceptual framework for designing mobile learning environments (Source: Danaher, Gururajan, and Baig 2009)

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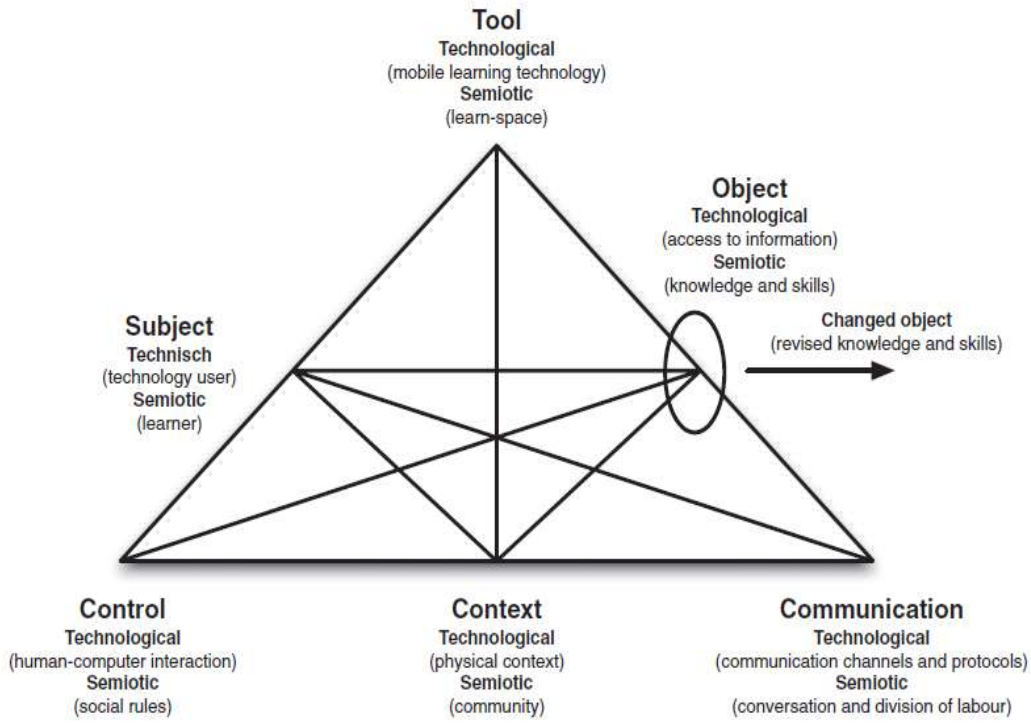

Figure1: Task model for mobile learning (Source: Taylor et al. 2006; Sharples et al. 2007b)

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Figure1: A mobile learning framework (Source: Motiwalla 2007)

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APPENDIX J

Table 11: Mobile Learning Characteristics: Developed Countries Vs Developing Countries

Mobile Learning Characteristics	**Developed Countries** (from literature)	**Developing Countries** (findings from this research)
Collaboration	Users are already collaborating with each other using mobile and non-mobile technologies. Informal and formal use of mobile devices in teaching and learning is already in practice (Motiwalla 2007).	Users are reluctant to collaborate with each other. A few of the teachers and students have started informal collaboration using mobile devices.
Blending	Mobile learning is already happening informally in university learning environments along with traditional learning activities. Teachers and students are collaborating and accessing learning resources using their mobile devices (Gururajan et al. 2011; Pérez-Sanagustín et al. 2012).	Blending mobile learning with existing learning streams such as face-to-face learning and e-learning tend to be the appropriate solution or ultimate starting point for university environments in developing countries.
User Experience	Majority of the users own smart phones and tablets. They are experienced with variety of mobile technologies, therefore, are confident to include mobile device in teaching and learning (Oliver 2008; Koole 2009).	Some users from strong financial backgrounds are experienced mobile device users, therefore, more confident to be involved in mobile learning.
Control	Students tend to be independent learners and found responsible learners when engaged in mobile learning activities (Chen 2009; Wishart and Triggs 2010).	Students tend to need teacher's control over learning process, therefore, mobile learning activities need to be designed carefully in order to consider and address this factor.

Mobile Learning Characteristics	**Developed Countries** (from literature)	**Developing Countries** (findings from this research)
Context	Mobile devices have been experimented to be useful in multiple contexts such as during data collection, field work and classrooms. Pilot studies have already been conducted showing positive results (Chen et al. 2003; Santos et al. 2010; Song 2011; Thüs et al. 2012).	Some informal contextual uses of mobile devices for learning have been done by students. There is no formal research or pilot study done in this regard.
Mobile Learning Activities	Teachers are already experimenting and engaging in formally and informally mobile learning activities for the courses they have been teaching (Naismith et al. 2004b; Traxler 2009).	Students have been doing some mobile learning activities informally on their own. Similarly, teachers have been using mobile devices for their own learning. There is little evidence of teachers and students trying to engage in mobile learning activities for a particular course.
Technical Support	Plenty of technical support is available formally in university environments (Motiwalla 2007; Naismith and Paul 2009; Traxler 2009).	There is lack of technical support available for students and teachers while trying to engage in mobile learning activities informally.
Flexibility	Mobile device provides flexible options for learners and teachers (Niasmith et al. 2004b; Pachler et al. 2012).	Students and teachers are convinced that mobile devices would add flexibility to the teaching and learning if implemented formally with the availability of appropriate technical support.
Usability	There are usability issues for mobile devices for learning due to the fact that mobile devices have not been designed for teaching and learning purposes. However, users in developed countries have fewer usability issues because they have more user experience with these devices than that of the users in developing countries (Oliver 2008; Koole 2009).	Users in developing world find more usability issues due to a few reasons. They do not have smart mobile devices and they call many issues as usability issues due to lack of their user experience.

Mobile Learning Characteristics	**Developed Countries** (from literature)	**Developing Countries** (findings from this research)
Connectivity	Users of teaching and learning environments in developed world experience seamless connectivity due to the advanced and established telecommunication networks and infrastructure (Kukulska-Hulme 2012).	There are more connectivity issues in developing countries; therefore it interferes with users' seamless engagement in teaching and learning using their mobile devices in and out of academic premises.
Cost	Mobile devices and mobile internet is expensive in developed countries than that of developing countries. However, users have more buying power, therefore they do not consider cost as a major obstacle towards the mobile learning engagement (Dyson 2009; Lundin et al. 2010)	Although, mobile devices and mobile internet both are comparatively inexpensive in developing countries; majority of students and teachers found it difficult to bear the cost of engagement in mobile learning on their own.
Awareness	Students and teachers are aware of benefits of mobile learning for teaching and learning environments; therefore tend to show more involvement and commitment for engagement in mobile learning (Oliver and Goerke 2008).	Majority of the stakeholders in teaching and learning environments do not have awareness of benefits of mobile learning they could have, therefore, they are reluctant to be involved in mobile learning.
Motivation	Students and teachers are self-motivated to experiment with mobile learning with their own mobile devices (Oliver and Goerke 2008).	Students and teachers are self-motivated and want to experiment and engage in mobile learning if they would be supported to own mobile devices and buy mobile internet data.
Negative usage	Users in academia in developed world are considered responsible for their attitude. There is very little been reported in research literature about negative uses in teaching and learning environments in developed world (Traxler 2009).	Users in developing countries particularly students have been reported to be involved in negative activities in the name of mobile learning. Negative uses might be reduced with more awareness and enforcements of certain ethics for mobile learning engagement.

Mobile Learning Characteristics	**Developed Countries** (from literature)	**Developing Countries** (findings from this research)
Educational Background	There is a strong structure of primary and secondary education in developed world; therefore students in universities have almost similar educational background. This educational background is stronger than that of developing countries. Therefore, users find lesser problems while start engagement in mobile learning activities (Oliver and Goerke 2008; Traxler 2009).	There is a great divide and variety in educational background of university students developed countries. This divide is due the different financial and geographic background of the students. Students from stronger financial and educational backgrounds already own smart mobile devices and have more user experience than the students from relatively low socio-economic backgrounds and less developed areas.
Training Needs	Training is considered an essential need for the teachers in teaching and learning environments in developed countries. Therefore, they would need a little training to involve in mobile learning if introduced formally in university environments (Chen et al. 2010; Uzunboylu and Ozdamli 2011; Fuchs 2012).	Teachers would need extensive training program if they would need to involve in mobile learning formally for university teaching and learning. Teachers from non-ICT disciplines are not familiar with smart mobile devices and using mobile internet.